School Shop

vol. XI no. 1
SEPTEMBER, 1951

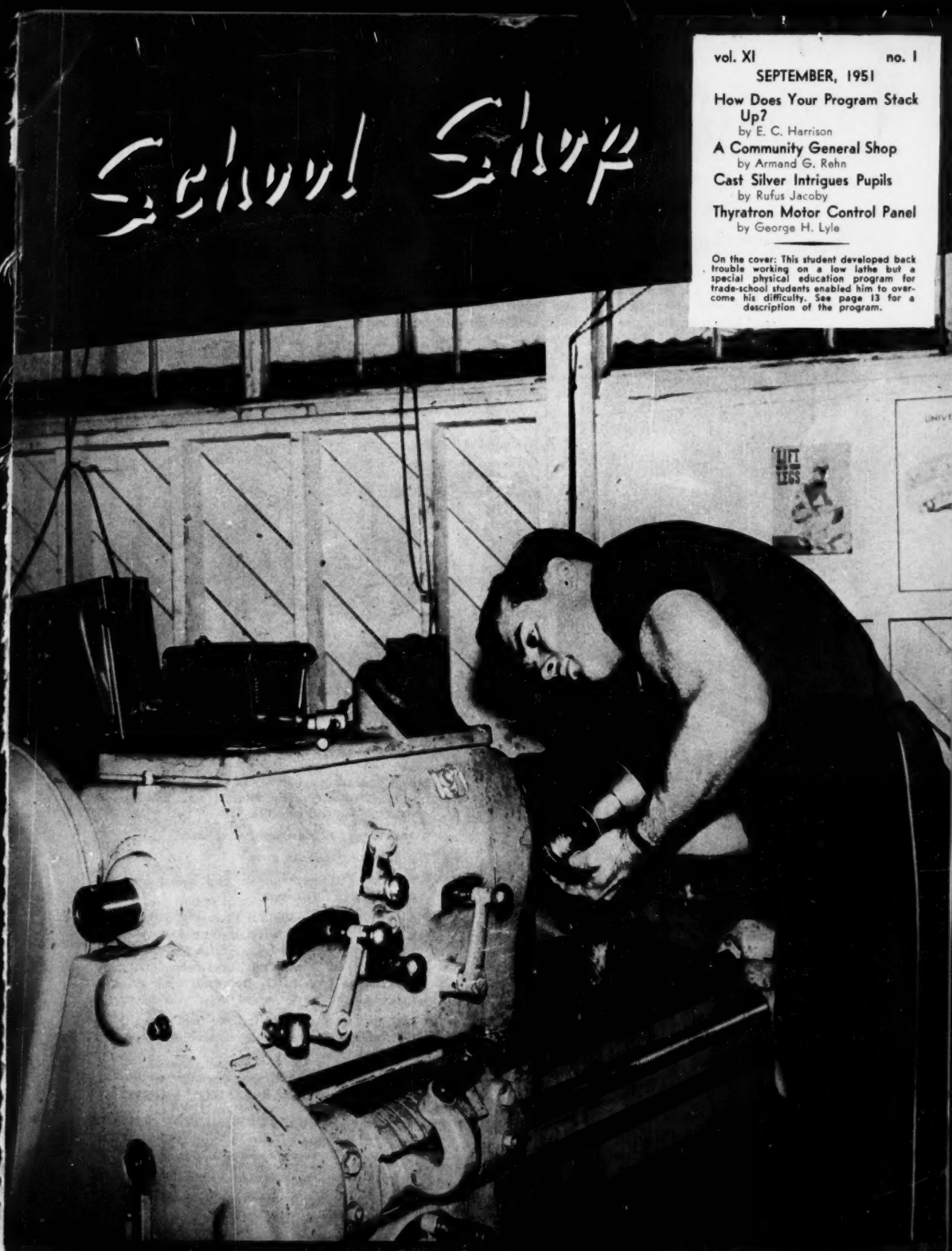
How Does Your Program Stack Up?
by E. C. Harrison

A Community General Shop
by Armand G. Rehn

Cast Silver Intrigues Pupils
by Rufus Jacoby

Thyratron Motor Control Panel
by George H. Lyle

On the cover: This student developed back trouble working on a low lathe but a special physical education program for trade-school students enabled him to overcome his difficulty. See page 13 for a description of the program.



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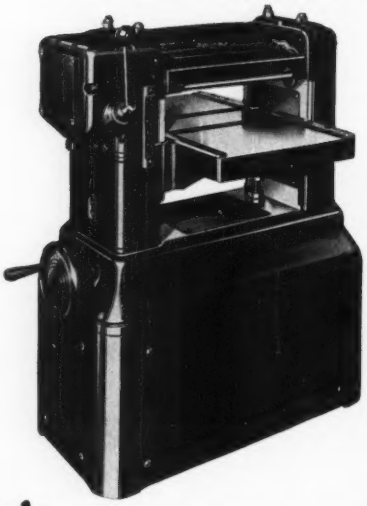

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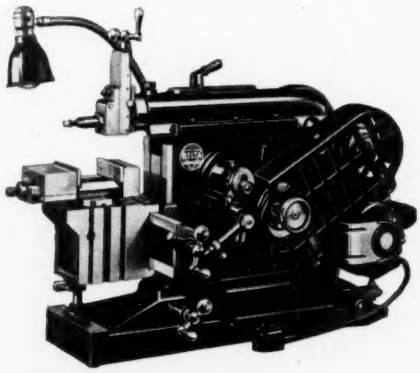

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Watch for it in October!

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School Shop

FOR INDUSTRIAL EDUCATION TEACHERS

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School Shop TALK

COMMENTS ON ISSUES FACING INDUSTRIAL EDUCATION

Youngsters Are the Losers

The disintegration of the Vocational Division of the U.S. Office of Education may well be on the way if Senate Bill No. 1149 is passed by Congress.

While this bill, which deals with the reorganization of the Department of Agriculture, applies only to the vocational agriculture activities of the Vocational Division, including teacher-training, the trend could well lead into the fields of trade and industrial education and distributive education.

Briefly, the bill calls for the shift of the Agricultural Education Services from the USOE to the Department of Agriculture. It is based on the report of the Hoover Commission and the fight is being led by the Citizens Committee for the Hoover Report which is a nongovernmental agency with powerful backing.

This group has the laudable purpose of streamlining governmental functions for more efficient and economical operation. Whether such desirable ends will be served by S. B. 1149 is debatable.

Department of Agriculture officials will have their own ideas about how the Vocational Agriculture Service should be operated. No doubt many vocational ag people will disagree with these ideas as they have occasionally done with Federal Security Agency and USOE officials in the past. What is one man's efficiency is another man's anathema.

On the score of economy, the evidence is in already. One of the arguments favoring the change is that the powerful farm lobbies will support increased appropriations for vocational agriculture. Aside from the merits of such increased appropriations, this does not sound like the "economy" the Hoover Report adherents want.

The real danger in this bill is that it will spell the end of the Vocational Division of the U.S. Office of Education. If S.B. 1149 passes, and it has exceptionally strong bipartisan support with such political opposites as Senators McCarthy of Wisconsin and Douglas of Illinois lending their names to the bill, the Labor Department will be eager at once to take over the Trade and Industrial Education Service of the Office of Education and the Department of Commerce will undoubtedly feel likewise about Distributive Education.

This whole procedure reverses the trend through the years of gathering together the educational activities of the federal government in one agency which can exert educational leadership and coordinate diverse programs. Mistakes have been made by the Office of Education, but there is little doubt that bigger ones would have been made if non-education-minded governmental agencies had had charge of these programs in the past.

S.B. 1149 is a threat to vocational education and, if passed, would seal the doom of a unified professional program of education for the young people of the United States.—*L. W. P.*

The Teacher Needs a Break

One of the great deterrents to professional growth of teachers is the unwillingness or lack of interest among principals and superintendents in making provisions for shop teachers to attend meetings of professional groups.

Many extremely valuable regional, county, and state meetings of industrial education groups are held which offer the teacher an opportunity to inspect other shops, exchange ideas on teaching techniques, and hear outstanding leaders. All too frequently the teachers' hands are tied as far as attendance is concerned because the school system makes no provision for substitute teachers or gives no money for travel expense.

Compared with our compatriots in industry, shop teachers get the short end of the deal. No industrial firm with any acumen hesitates about sending its men to meetings to get ideas which will help the company with its problems.

A concerted effort should be made by each professional organization in the field to create a working relationship with the school systems in its bailiwick so that teachers can participate in the activities of the organization. Some state and regional groups have made such overtures in the past with notable results. Attendance and interest have gone up in professional organizations when the way was cleared so that teachers could take the time without deductions from their salaries and, in some cases, be given expense money to attend meetings.

Administrators and supervisors frequently get all the breaks in this regard. Teachers need some breaks as well.—*L. W. P.*

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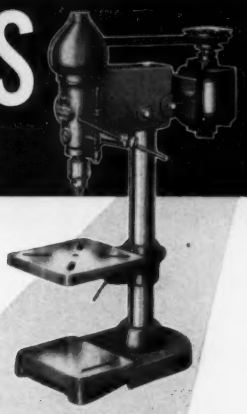

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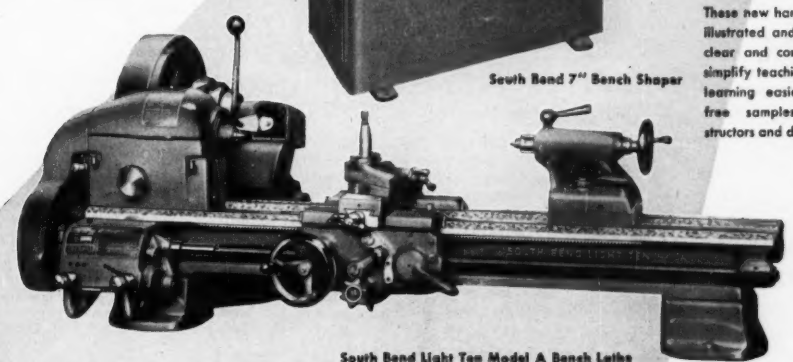

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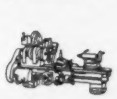

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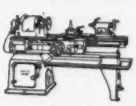

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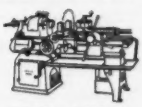

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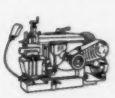

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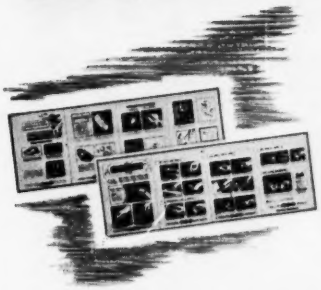

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How Does Your Program Stack Up?

By E. C. Harrison

Every so often it is enlightening to stand back and take a look at what you are doing in terms of broad objectives as well as smaller details. E. C. Harrison, Director of Industrial Education, Southern University, Baton Rouge, La., offers such a check list in this article.

THE criterions listed below are based on the belief that industrial education is an integral part of the total education program and that it contributes to the optimal development of students through experiences related to tools, materials, processes, and products of industry.

This optimal development involves two aspects of education.

First, there are common experiences or common learnings that all students should have regardless of the vocations they intend to follow.

Second, there are special interests, talents, and needs which are unique.

Just to keep the record straight, let us define industrial education.

Those aspects of industrial education which aid students in meeting their common needs or which provide opportunities for students to develop their special interests and talents (not for vocational purposes) is industrial arts. When industrial education is used to prepare students for some industrial occupation, it is vocational industrial education.

Now for the criterions which are intended to stimulate some selfappraisal in each of seven areas.

Philosophy and Objectives

1. The objectives of the industrial-education program should be consistent with the philosophy and objectives of the whole school.

2. The objectives of the industrial-education program should be consistent with the values of democracy.

3. The values and objectives of the program should be continuously reexamined and reconstructed as experience demands.

4. The objectives should be the result of group planning.

Administrative Organization

5. The industrial-education program should be considered as an integral part of the educational program.

6. Industrial-education teachers and representatives of the community as well should share in the planning of, and in the execution of, the educational activities of the whole school.

7. The administering of the affairs of the industrial-education program should be shared with teachers in other subject areas.

Curriculum

The Industrial-Arts Phase

8. The types of work included in an industrial-arts program should reflect the major areas of industry.

9. The industrial-arts program should be geared to the general educational or common needs of students in the major problem areas of living.

10. The industrial-arts program should provide worthwhile work experience for the students.

11. The time devoted to industrial-arts experiences should be that proportion of the school work that is needed for the students to realize to the fullest the potential values of industrial arts.

The Vocational-Education Phase

12. Industrial education should place emphasis on the vocational objective near the end of the secondary-school period.

13. Vocational education should not be confined to narrow specialized training.

14. The proportion of the student's time devoted to vocational education should be conditioned by the time needed for the student to grasp the knowledge and skills necessary for successful entrance into the vocation of his choice.

15. The vocational program, in cooperation with community enterprises, should provide work experience for its students.

16. Technical emphasis in a vocational-education curriculum should be consistent with industrial trends.

Teaching Personnel

17. Teachers of industrial-education subjects should have at least a college education.

18. Teachers should show evidence of possessing the desire for continuous professional growth by participating in professional affairs, by maintaining a professional library, and by engaging in graduate study.

19. Industrial - education teachers should be technically competent.

20. Industrial - education teachers should know how an individual learns and how to facilitate learning on the part of the individual.

21. Teachers should have had industrial work experience of duration sufficient to demonstrate that they are capable practitioners and to acquire an understanding of the social forces affecting the life of the industrial worker.

Student Personnel

22. All high-school students, boys and girls, should receive industrial-arts experiences.

23. Students enrolled in vocational-education courses should be those students who can profit best from vocational training.

Laboratory Features

24. The laboratory should be [illegible] enough to provide for maximum activity on the part of each student with minimum interference from other students and laboratory facilities.

25. The shape of the laboratory should be of such nature as to facilitate arrangement of equipment, effective lighting, and adequate location of auxiliary features.

26. The laboratory arrangement should reflect industry at its best.

27. Walls should be treated with sound absorbing material.

28. The walls should have a wainscot of durable material that is easily cleaned.

29. Floors should be constructed of material that is durable and safe.

30. The lighting of the laboratory should be adequate enough to reduce eye fatigue to a minimum, thus promoting safety and stimulating learning.

31. All technical laboratories should have adequate auxiliary rooms and compartments.

32. The equipment should reflect the objectives of the industrial-education program.

33. Each machine should be durable, painted to be easy on the eyes, and appropriate for the maturity of the students.

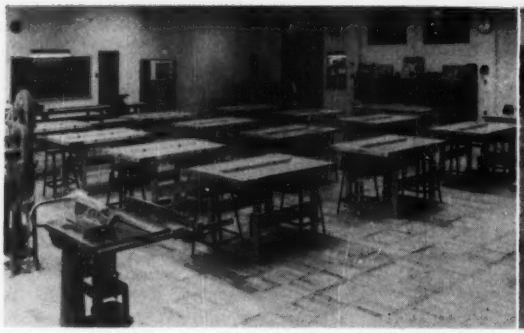
34. All machinery should be safe for students to operate.

35. Machines purchased for an industrial-education laboratory should be easily maintained.

36. A student personnel system should be organized to provide opportunities for students to share in the administration of the industrial-education program.

37. The student personnel organization, concerned with more than clean-up responsibilities, should reflect personnel organizations in industry.

38. The instructor must assume the position as manager of the personnel organization, but the students should share in planning the organization.



This photo of the new general shop in the Dayton St. Elementary School, Newark, N. J., was taken from the point shown as (A) in the drawing. Band saw and circular saw are in foreground. Printing area is in far corner.

Grinder, drill press, and disc sander in foreground as seen from point (B). Against far walls: reference library and table, wash trough, home mechanics bench and bulletin board, assembly bench, and wood-tools cabinet.

100 Sq. Ft. Per Pupil—

A Community General Shop

By Armand G. Rehn

Industrial arts has too long been "hiding its light under a bushel," contends the author. A school program which takes into account the needs of the community will reap the benefits of community support. This school combines a complete elementary industrial-arts program with a full schedule of evening adult classes. Armand G. Rehn is Director of the Department of Practical Arts for Newark, N. J., Schools.

WIDE interest has been aroused with the construction of the Dayton Street Elementary School in Newark, N. J., which was planned and built with community needs in mind. The large number of children and young adults flooding into the area moved school authorities to combine elementary schooling through grade 8 with a large general adult-education program.

The industrial-arts program, as in all Newark schools, is provided for grades 5 through 8. There is a waiting list for the evening adult classes in this subject, and the possibility of industrial arts as an avocational medium under proper facilities has spread throughout the city. Community support of the school has strengthened as a result of provision of adult classes.

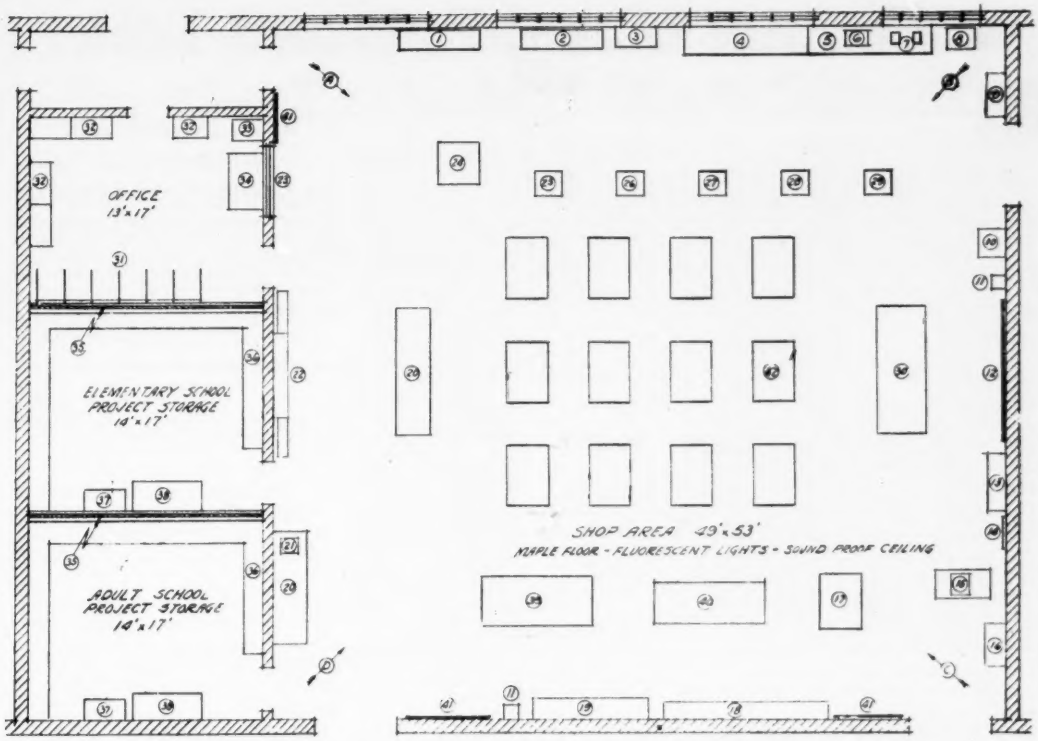
The shop layout to accommodate juvenile and adult needs provides 100 square feet of work area for each student. (See drawing and photo.) Most existing school shops have only about 60-70 square feet per student, which results in occasional friction from students getting in each others' way. The machine equipment, too, is in excess of the average elementary industrial-arts shop, but is desirable nevertheless under all conditions. Some of the ideas listed below which were incorporated in this layout may aid others in planning general shop areas in this rapidly expanding field.

1. Project storage rooms are provided both for the elementary pupils and the adult students. A major problem in every shop is adequate storage space for projects under construction. These rooms also provide excellent finishing areas: A suitable finish enhances any project, but crowded conditions often handicap the work and are hazards to finishes in process of drying. Lack of ventilation in storerooms often prevents their use for working purposes and causes rapid deterioration of supplies. In the Dayton Street school there is a three-foot wire grill between the project storage rooms, and between the elementary project room and the office, as well as grills over each project room door and the shop.

2. A centralized core area, most convenient for a general shop, is provided

At point (C) type cabinet dominates view, with reference table at left and home mechanics bench beyond. Wood tools cabinet sets between doors to elementary project storeroom and office, with assembly bench in front.

The view of the shop from point (D) shows line-up of wood and metalwork machines at top of drawing: band saw, scroll saw, disc sander, drill press, and grinder. Behind, along wall: lathe cabinet, work benches, and buffer.



Floor Plan Description

(1) Four-speed wood lathe
(2) 16-speed wood lathe
(3) Lathe accessories
(4) Maple-top bench
(5) Metal-top bench
(6) Oven for plastics
(7) Combination furnaces
(8) Buffer
(9) Plastics and leather cabinet
(10) Foreman's bench
(11) Drinking fountain
(12) Green glass blackboard
(13) Metal tools cabinet
(14) Master electric switch
(15) Pilot hand press
(16) Printing supplies cabinet
(17) Type cabinet
(18) Reference library
(19) Wash trough
(20) Assembly bench
(21) Mitre box saw
(22) Wood tools cabinet
(23) Plate glass window
(24) Circular saw
(25) Band saw
(26) Scroll saw
(27) Disc sander
(28) Drill press
(29) Grinder
(30) Metal work bench
(31) Metal lumber rack
(32) Metal supply cabinet
(33) Filing cabinet
(34) Teacher's desk
(35) Three-foot wire grill
(36) Four 18" shelves, 24" apart
(37) Paint cabinet
(38) Stain bench
(39) Home mechanics bench
(40) Reference table
(41) Bulletin board
(42) Two-student bench

in which the class may be assembled for lecture, demonstration, and class work, or which may be used for individual student bench area. From this core the instructor can radiate the activities for groups or individuals. Each student has his own metal stool which fits under his workbench when not in use, and which he takes with him to the core area.

3. Suitable and convenient storage cabinets for each area of work are provided. They are necessary in such a diversified program, preventing undue movement by students and providing the instructor with his teaching material and supplies.

4. With 100 square feet of work area per student, a minimum of three feet in spacing all equipment and benches is possible. Each student has ample room for working and handling his project. Assembly benches for large projects give plenty of level surface area.

5. Proper lighting, often neglected in school shops, is provided by a sufficient number of fluorescent lights set flush in the ceiling. Shadows, which do not contribute to suitable working conditions, are eliminated.

6. An important safety feature is a master switch system which controls all the machines in the shop. These switches are conveniently located on three of the shop walls, away from the machine area, thus relieving the instructor of considerable worry.

7. Delivery of lumber to a school shop is sometimes a major operation because of its location. In this shop, lumber can be delivered direct from the truck to the office, and easily removed from the open-side rack into the shop itself for cutting on the circular saw.

8. Suitable drinking fountains eliminate many requests to leave the room.

No shop regardless of space and equipment can function efficiently without a teacher endowed with the broad principles of industrial arts. Wilbur Snyder, the instructor of this general shop program, has established vitalized programs in leather, art metal, wrought iron, plastics, printing, wood, home mechanics, and mechanical drawing.

A Handy Wheel Pull and Jack

By Z. E. Rataiczak

These two machine-shop projects are simple to make and have a variety of uses, both in the shop and around the home. The wheel pull is a good beginning project, while the jack is suitable for more advanced students. Z. E. Rataiczak is machine-shop instructor in the Bellaire, Ohio, High School.

I HAVE found the versatile wheel pull and small jack sketched here to be excellent machine-shop projects as they teach fundamental principles and yet are not too difficult for the average pupil, and they have many uses.

The wheel pull, with its simple design, is an ideal project for beginning students. I have found it will remove some of the most stubborn wheels, and with its three-inch slot, it is easily adaptable to various wheel, gear, flywheel, and pulley diameters. For smaller wheels and pulleys, this design can be cut down to 4" in length instead of 8" and will serve very well. Any six-bolt brake drum can be removed by using longer cap screws of the same size as in the drum.

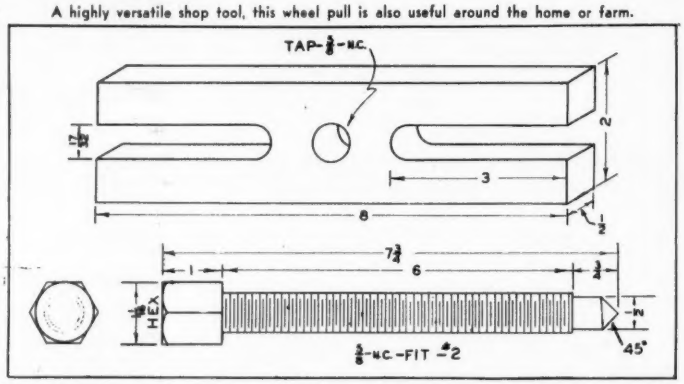
Materials required for the wheel pull include: One piece of ½" x 2" x 8" boiler plate, and one piece of 1 3/16" D. x 8" truck axle or tool steel.

The jack project gives training on the lathe, milling machine, and drill press. Lathe work includes experience in chucking, facing, boring, internal thread cutting, between-center turning, and external thread cutting.

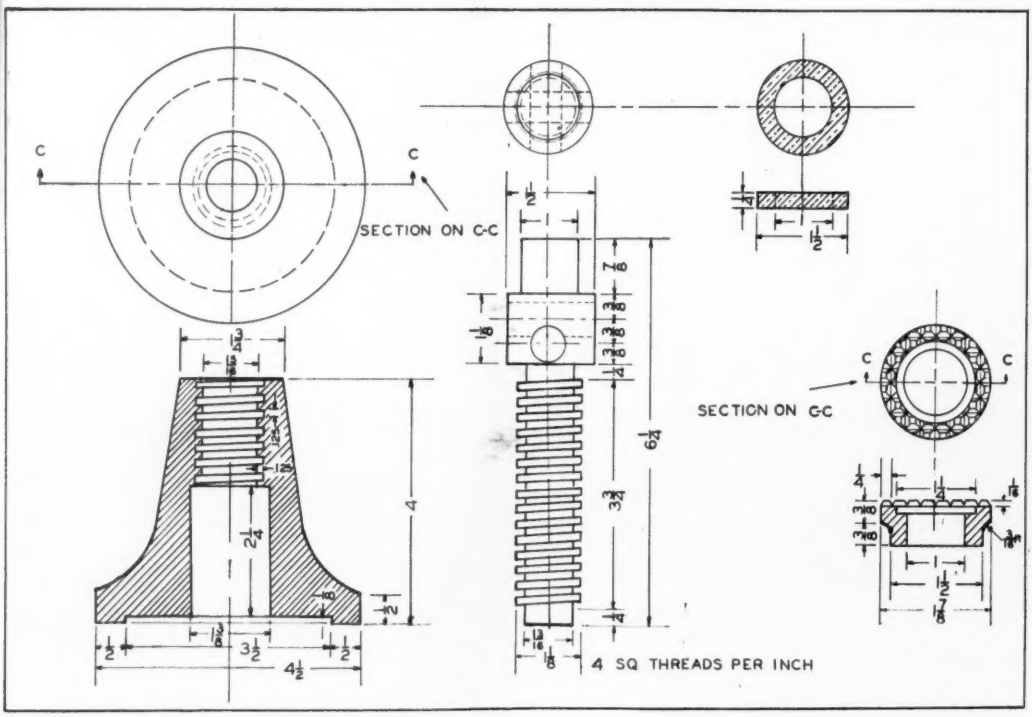
The jack is inexpensive to make. The simple base is my own design, and we have them cast at the local foundry. Casting does not cost too much since there is no core to the pattern. We are able to complete the job for less than two dollars.

The top of the jack screw is recessed ⅛" deep to within 1/16" of the outside edge; this is then peened over so that the top will turn freely but will not come off. Note the use of a brass collar under the screw top. This helps to cut down friction in raising a heavy load.

A highly versatile shop tool, this wheel pull is also useful around the home or farm.



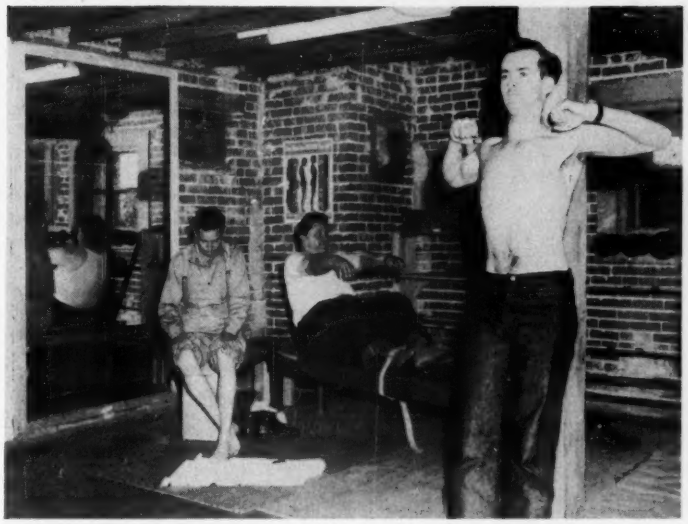
This jack can be completed by the machine-shop student for less than two dollars, and teaches several basic principles.



Tailor-Made Physical Education for the Technical High School

By H. G. Cleaveland

Many programs of physical education in trade and technical high schools are standard programs, the same as given to all students. At Santa Monica, California, Technical School the setup is specially designed to be helpful in meeting the physical problems of people in industry. H. G. Cleaveland is Director of Health and Physical Education at the school.



Students taking corrective exercises. Don, on the right, is doing a back and shoulder girdle corrective exercise while the other two are doing a foot exercise and an abdominal exercise.

MANY tradesmen (like Don, a vocational machine-shop student, about whom more later) can be recognized by their posture. They have round shoulders, a hollow back, and walk with a shuffling gait. When this condition becomes severe, fatigue and pain are experienced soon after commencing work.

There are definite reasons why this characteristic ailment develops. The very nature of most manual work causes an overdevelopment of the anterior shoulder girdle muscles at the expense of the posterior muscles, thus pulling the shoulders forward. Consequently, proper alignment is impaired and is compensated by an arching of the lower back and a protrusion of the abdomen. This faulty posture also has its effect on legs and feet. The end result is early fatigue, pain, poor appearance, and in some cases inability to work efficiently.

Conditions of this nature can and should be largely corrected through a sound program of physical education in schools; trade schools in particular. The Santa Monica Technical School has instituted such a program.

Students are given an individual medical examination by the school physician. Special attention is given to muscular development, posture, and the history of any injuries. The results of the examination are given to the physical instructor with the physician's recommendations. A program of development or correction is then set up by the instructor to satisfy the student's particular needs.

Let us consider Don, for example. Don enrolled in the machine-shop class, after having worked a year at a lathe which was too low for him. As a result, the characteristic posture of round shoulders, forward head, hollow back, and protruding abdomen was developed. Don complained of frequent shoulder and back pains and soreness in his legs and feet. The program prescribed for Don involved stretching exercises for the muscle groups of the chest, lower back, and legs and developmental exercises for muscles of posterior shoulder girdle, abdomen, and feet. He worked at these exercises for two and sometimes three half-hour periods weekly under supervision. After one semester his posture had been largely corrected. The correction was important because he is now able to work long hours without the discomfort of pain and soreness. Equally important to Don is the knowledge he gained regarding ways to prevent the recurrence of a similar disorder.

Bill typifies another group of individuals who receive benefit from the program. He had injured his back while lifting. His program involved exercises

(*Continued on page 44*)

Welding students being given a lecture-demonstration on the techniques of proper lifting.

Cast Silver Will Intrigue Pupils

By Rufus Jacoby

Here is an unusual project which holds student interest while it gives an appropriate insight into an industrial activity. While not strictly a craft project it does teach pattern making, molding, and casting of silver and adds variety to the program. Rufus Jacoby teaches at Calvin Coolidge High School, Washington, D. C.

TESTED 55 PROJECT

CASTING sterling silver in sand molds is similar to the molding and casting in a foundry except that it is on a small scale. The process is intriguing and gives an insight into pattern making, molding and casting metal. This type of work is especially good for class use. School pins and award medals can be made in the school shop and reproduced on a large scale.

Making the pattern.—Make sketches of the design full size on paper. The design may be an animal head, a letter such as a school award pin, or a design modeled in low relief as the medal shown in Fig. 2.

The original pattern may be made of wax, plasticine, wood, clay, or plaster of Paris. The medal pattern shown in the photographs is carved in plaster of Paris. If a more permanent pattern for the original is desired, a cast of the plaster original may be made of lead in a sand mold. Since lead is soft, the design can be refined or reshaped by carving and scraping the lead.

Plaster of Paris is a good material to use for the pattern, because it can be cut and scraped easily when it is "green" and because it is quite strong and shows shadows and outlines well.

Making the form.—After the design is sketched on paper, draw the outline of the design on a smooth piece of wood and build up a form along the outline lines with plasticine. The plasticine form should be as high as the thickness of the proposed pattern.

Preparing the plaster of Paris.—Prepare the plaster of Paris by placing a small amount of water in a pan and sieving plaster into the water until about half of the water is absorbed. Stir the plaster a little and add water or plaster until a thick creamy mixture is obtained. Next, pour the plaster into the plasticine form and smooth it off flush with the top of the plasticine. Let the plaster set until it is solid; then remove the plasticine form and let it dry. After it is dry, smooth the top surface and the edges with a used file.

Next sketch the design on the plaster with a pencil, wet the plaster to soften it, and start cutting and scraping the design (Fig. 2).

Tools to cut and scrape the plaster can be made of $\frac{1}{8}$" x 6" tool steel rod by forging the ends to the desired shape. Design and forge the tools as they are needed.

Pattern draft.—All pattern surfaces must taper from base to top in order to permit the removal of the pattern from the sand without breaking the mold. This taper is called *draft*.

To produce a solid sterling silver casting the pattern surfaces must be at least 1/16" thick. The pattern may have a flat solid base, or it may be hollowed out from the back under the raised or high surfaces in the design.

Preparing the sand for making the mold. — You can purchase prepared jeweler's sand, or you can prepare your own sand. Make your own by sieving fine casting sand through wire-screen netting to remove any foreign matter, then adding glycerine to the sand to hold it together. The glycerine is mixed with the sand by *cutting* the sand. *Cutting* the sand is the term used to describe the mixing and breaking of the sand into fine light particles by cutting off small portions of sand from one pile and scraping it into another pile with the edge of a piece of metal or scoop. After the sand has been cut several times, let it remain in a pile for a day to allow the glycerine to be distributed uniformly. The sand is properly prepared when it remains in a mass without breaking and shows the sharp impressions of the hand after it is compressed in the palm and the hand is opened.

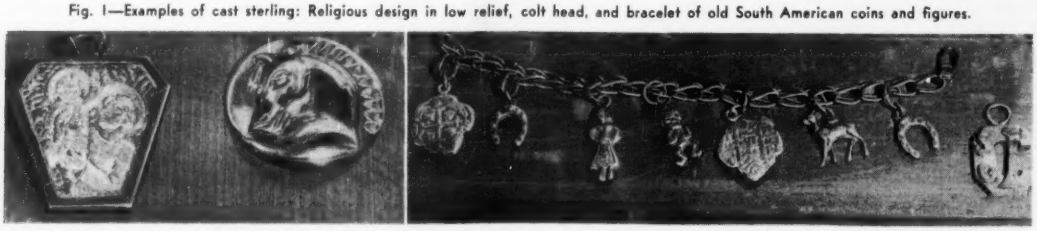
Fig. 2—Carving the design in plaster of Paris.

Flask and sieve.—The mold is made in a cast-iron *flask* consisting of two pieces parted in the middle; the half with the pins is the *drag* and the half with the holes is the *cope*. Jeweler's flasks are made in a number of sizes. A sieve to riddle the sand over the pattern in the flask is made by cutting the ends out of a food can and soft soldering a piece of wire screening over one end.

Molding.—To make the mold, lay the cope with the sprue hole down on a piece of wood slightly larger than the flask. This piece is called the follow board. Next lay the pattern in the cope with the base resting on the *follow board* about $\frac{3}{4}$" from the sprue hole. The sprue hole in the flask permits pouring the metal into the mold cavity.

Next, place some parting powder—charcoal dust or fine brick dust—in a muslin bag and shake the bag over the flask to cover the pattern with the powder. This powder bag prevents the sand from adhering to the pattern, ensuring easy removal. Riddle sand into the flask (Fig. 3), covering the pattern with about $\frac{1}{4}$" of the fine sand. Then fill the flask with the cut sand, compressing it lightly with the fingers. Take care not to compress the sand too hard. If it is compressed lightly, the gases and air can escape through the porous sand

Fig. 1—Examples of cast sterling: Religious design in low relief, colt head, and bracelet of old South American coins and figures.



when the molten metal is poured into the mold cavity. Scrape the excess sand off the top of the cope with a straightedge, place another board similar to the follow board on top of the cope and turn the cope upside down. Then remove the follow board, and the bottom of the pattern is exposed in the sand.

Next place the drag on the cope, shake a small amount of parting powder on the sand and the pattern. Then riddle sand into the flask. Fill the flask with sand, compress it, and scrape the excess sand off the top of the drag.

Place the follow board on top of the drag, lift the drag off the cope carefully, and turn the drag around laying it down on the follow board. Place a follow board on the top of the cope, turn it upside down and lift the cope from the board. When the cope is lifted, the pattern should remain on the board. If it remains in the sand, tap it lightly with the end of a pair of tweezers to loosen it. Take the pattern out of the sand.

Next, cut the gate, which is a channel in the cope and drag running from the sprue hole in the flask to the pattern cavity for the purpose of pouring the molten metal through (Fig. 3). A bent piece of tin plate or rounded end of a pair of tweezers can be used to scrape the channel in the sand.

Large castings may require several gates cut in the sand around the edge of the cavity to act as reservoirs for the molten metal in the cavity. As the molten metal cools, it contracts and draws the molten metal from the gates into the pattern cavity, thus insuring a solid casting.

Next dust the pattern cavity with fine brick dust or charcoal powder. This produces a smoother surface on the casting. Close the flask, place the follow boards on the outside of the flask and hold them in place with a C-clamp. Stand the flasks upright on a fireproof table. The mold is now ready to receive the molten metal.

Operating the furnace.—Melt enough sterling scraps for your casting in a No. 0 graphite crucible which is placed in the center of the furnace so the flame can swirl around it. Put a level teaspoon of borax in the crucible to help the sterling melt and the same amount of powdered charcoal to protect the sterling from oxidation (molten sterling absorbs oxygen readily). The borax and charcoal will float on the molten metal in the crucible and will float to the top of the sprue if it is poured in the mold.

Place the nozzle of a furnace blow torch about 2" from the furnace opening and directly in line with the opening. Light the torch and turn the gas on full. Then turn the air on gradually. The torch will use from 5 to 10 pounds of air pressure. Adjust the volume and pressure of the air until the torch roars and a white flame comes out the hole in the furnace cover. The "homemade" furnace shown in Fig. 4 will melt several ounces of sterling in 10 minutes.

Watch the metal in the crucible and, as soon as it is completely molten, pour it into the mold. To insure smooth castings, the metal must be poured at the lowest possible temperature. Also, pouring must be done quickly and continuously (Fig. 4). The molten flux and charcoal is poured into the mold with the sterling, and it will float to the top of the sprue.

The metal solidifies in several seconds so the flask can be opened as soon as the crucible is returned to the furnace and the lid replaced. Cool the castings in water or pickle immediately after taking them out of the sand to avoid the danger of someone picking them up with the fingers.

You will notice that the sand in contact with the metal is black or "dead" (Fig. 5). This "dead" sand should be scraped off and disposed of, and the sand in the flask broken up and cut in preparation for further use.

If the casting is good, clamp the sprue in a vise and cut it off with a hacksaw or jeweler's saw. If the metal is poured at the correct temperature and the mold is good, the surface of the casting will be quite smooth with a uniform texture.

This is the finished surface on some types of castings. Small intricate designs are smoothed with chasing tools—punches with faces shaped and polished to fit portions of the casting. Large flowing surfaces can be made smooth with needle files and Scotch stone; then buffed with fibre wheels charged with abrasive.

The Melting Furnace

You can purchase a melting furnace or make one yourself. The furnace in Fig. 4 is homemade and has lasted through six years of school use. If you decide to make your own, you may make the outside shell of the furnace out of a section of a five-gallon steel drum. The drum must be at least 12" in diameter and 11" in height. Use a baby-food can as a form for the hole through the lining. A hole the diameter of the baby-food can is cut in the side of the drum with the center 5" from the base. A food can is also used to make the form for the inside furnace wall. This can must be at least 5" in diameter so that the cavity inside the furnace is large enough for the crucible and still allows space for the flame to swirl around the crucible. It must be 8" or more in height so the top is as high as the sides of the drum.

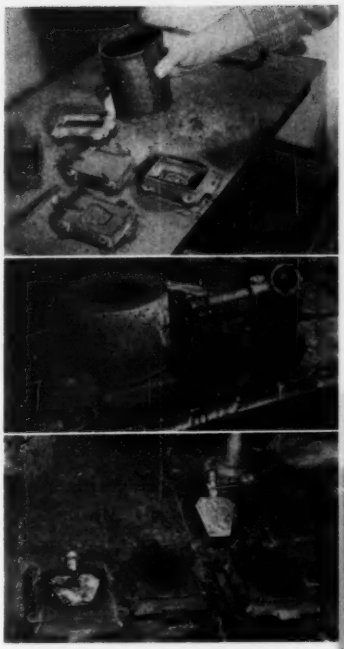


Fig. 3.—Riddling sand over the pattern. The opened flask on bench top shows mold cavity.

Fig. 4.—Pouring the molten sterling into mold cavity. Note homemade furnace and gas torch.

Fig. 5.—The opened flasks showing the castings. The black sand in the flasks is "dead" sand.

Furnace lining.—To prepare the lining, crush several fire bricks to the size of marbles and mix equal amounts of fire brick and fire clay; then add water, and mix until a thick concrete-like mixture is obtained. Fill the base of the furnace shell with 3" of the lining mixture and compress it by tamping with a stick. Next place the inside furnace form (can) on the bottom lining and run the baby-food can through the hole in the drum against the inside form. Fill the space around the forms with the brick-clay mixture. As the lining dries, it will settle so the top edge is built up about ½" above the drum wall.

Place the furnace in a dry place to dry for a week; then remove the inside forms to hasten the drying. Several more weeks are required for thorough drying. After the lining appears to be dry, heat the inside of the furnace with the torch, heating for several minutes the first day and increasing the time gradually each day. When you heat it the first time,

(*Continued on page* 36)

Display Board for Wood Finish Aids Pupils in Projects

By M. F. Foss

This teacher-made instructional panel enables students to help themselves in the selection and finishing of woods for various purposes. M. F. Foss teaches industrial arts at Miami University, Oxford, Ohio.

SEVENTH-GRADE through university students in our woodshop have been aided for the past five years in the selection of finish and materials for projects by the panel board teaching aid described here.

The various woods available in the laboratory are neatly mounted on the panel board. Each sample is ½" thick, 2" wide, and 10" long. It is divided into sections by a circle saw cut about ⅛" deep. The first section of each sample is given a very light wash coat of white shellac, intended mainly to keep it clean. The other sections are finished in as many ways as there are suitable finishes for the wood available. Underneath each section is a skeleton outline of steps involved in the finish of woods in that section.

White oak is divided into four sections, unfinished and the following types of finishes:

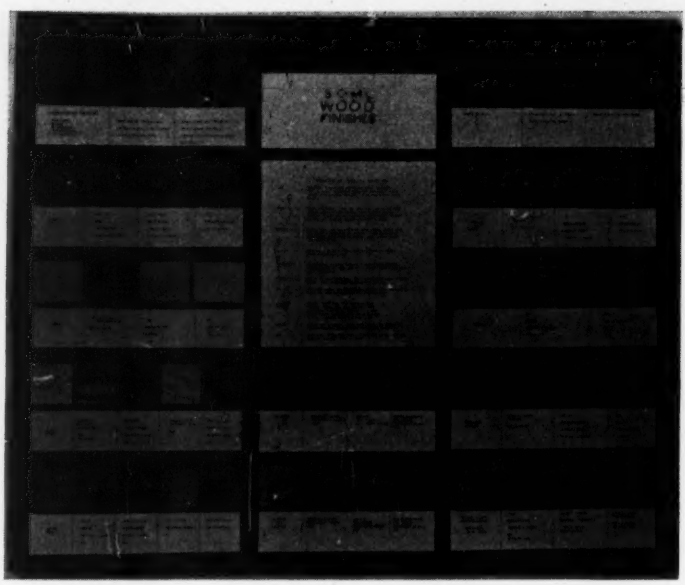
Oil	*Stain* (oil)	*Oil*
Fill	Fill	Shellac
Shellac	(colored)	(wash)
(wash)	Shellac	Wax
Varnish	(wash)	(2 coats)
(2 coats)	Varnish	
Rub	(2 coats)	
	Rub	

Poplar is divided into five sections, unfinished and the following types of finishes:

"Minwax"	*Stain* (oil)	*Shellac*	*Shellac*
(2 coats)	Shellac	(wash)	(wash)
(Ipswich	(wash)	Varnish	Enamel
Pine)	Varnish	(2 coats)	(under-
Wax	(2 coats)	Rub	coat)
(2 coats)	Rub		Enamel
			(2 coats)
			Rub
			(water)

The finish samples serve several purposes. If a student says, "I want a light finish," he can look at the chart and visualize how his project will look in

(*Continued on page 36*)



Any woodshop can have this neat panel board which graphically illustrates wood finishes.

EXPLANATION OF TERMS AND DRYING TIME (Fig. 1)

OIL	One-third turpentine; two-thirds boiled linseed oil. Heat in double boiler and apply hot with rag. Remove excess after 15 minutes. Allow 24 hours to dry.
STAIN	Apply with brush. Wipe off with rag. Turpentine will lighten color of spirit stains. Allow six hours before shellac coat on oil stain or varnish over spirit stain.
PASTE FILLER	Thin with turpentine to thick cream. Color with ground in oil colors. Apply heavy coat; wipe across grain when it will form roll under finger. Allow 24 hours to dry.
SHELLAC	Wash coat: one-half liquid shellac; one-half alcohol. Allow six hours to dry. For best results, apply thin and brush as little as possible.
VARNISH	Allow 24 hours between coats. Dry 48 hours before rubbing. All shellac, varnish, filler, and enamel coats must be rubbed smooth to the touch with 6-0 sandpaper before the next coat is applied.
RUB	The final coat of varnish should be rubbed with pumice and water or pumice and paraffin oil. Final coat of enamel should be rubbed with pumice and water. Remove all trace of pumice with soft cloth wet with paraffin oil or water.
CLEANING BRUSH	Shellac, Spirit Stain — Alcohol, soap, and warm water "Minwax", Oil Stain, Varnish, Undercoat, Enamel — Turpentine or kerosene, warm water, and soap
"MINWAX"	Liquid wax and stain. Apply with brush. Wipe off after 15 minutes. Re-coat after 24 hours.
WAX	Paste wax. Apply thin coat with cloth. After ten minutes, buff thoroughly. Re-coat after one hour.

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"Arizona Pioneer" Chair

By Stan Schirmacher

It should be easy to interest beginning students in this project, with its "frontier" flavor and unusual yet simple design. It is time-proven, as the original has seen many years of service. An excellent handtool project teaching fundamentals of sawing and finishing. Stan Schirmacher teaches in the Cottonwood, Arizona, High School shop.

Student applies varnish to complete chair.

THIS novel chair was discovered by the author in the scenic Oak Creek Canyon country—Arizona's Grand Canyon No. 2. It is truly an "Arizona Pioneer" because it was designed by the late G. W. Derrick, an Arizona shopteacher of past decades. It is made entirely from one piece of 1" x 14" pine, 6' long.

The original design (as shown in the small photo) was altered by changing the proportions of the back and seat, and adding one inch to its legs. Also, the original was nailed together and the redesign is fastened mainly with screws, and the direction of grain in the seat is placed "cross-ways" instead of in line with the back as in the first model. (One other change was made, temporarily, by the students in the author's classes by using discarded curved maple school desk seat boards—while they lasted!)

The layout of parts, in order to cut the complete five-piece chair out of a 6' x 13⅝" board, is shown along with the dimensions. For quantity construction, "templates" should first be cut out of sheetmetal. Of course, only one pattern piece is needed for the two sides. In marking, the exact distance between the layout of parts need not be adhered to, for this is only an approximate minimum necessary to allow for hole boring, as the total length shown here is about 2" less than 6'.

This model of the "pioneer" chair, unvarnished and assembled with 8d finishing nails, has seen more than a decade of service.

While the parts could be quickly bandsawed (and the hole in the back jigsawed) the chair makes an excellent hand-tool project and is thus described.

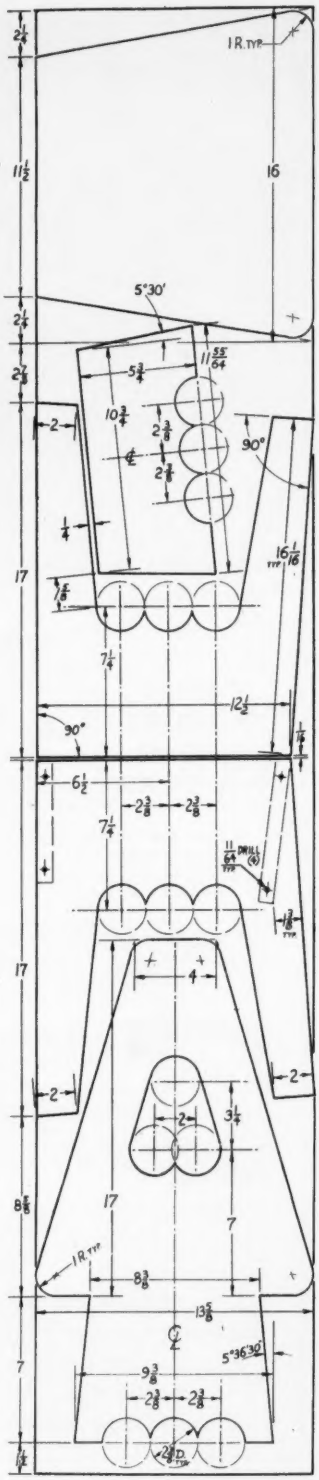
The board may be first sawed at the 1/16" cut between the side pieces and the seat part sawed off, but the other cuts have to wait until the 15 holes are bored with the expansive bit.

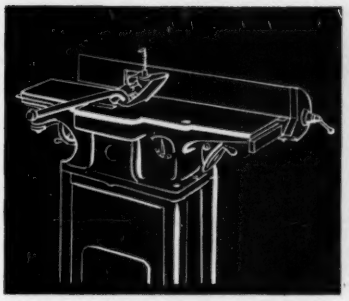
After the large holes are bored, the back can be released by sawing beyond its long slant lines into the holes of the side's pattern. These saw cuts should be slightly away from the line to allow for planing. The saw cuts on the inside edges of the legs (sides), however, will have to be close to the lines because, of course, a plane cannot finish them off. Also, the two cuts in the back opening will have to be carefully compass- or keyhole-sawed and later hand-filed and sanded smooth instead of planing. The 1" radius corners are rounded by sawing and filing.

NOTE: In ripping the angle cuts at the base of the back, and, also, in sawing the ends of the front piece, the saw has to be held 5½° from perpendicular; that is, they have to be bevelled "under" at a 5½° angle because the front of the chair is flared-out more than the back. The front piece could be sawed with the mitre box saw set at 5½° and then bevelled to the 5½° with a block plane. The four holes in each side piece, for #8—1½" R.H. screws, should be drilled at the proper 5½° angle, also.

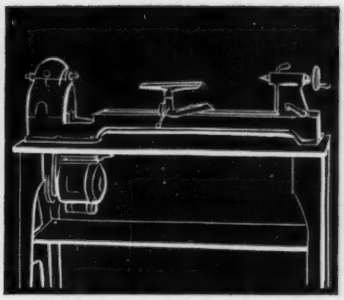
Glue applied at the joints as the parts are screwed together will strengthen the chair.

(Continued on page 22)

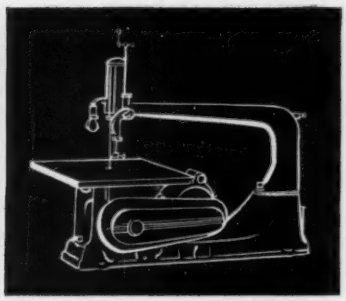




6" Jointer For handling narrow strips, planing thin stock, surfacing, and beveling, as well as jointing. Its versatility alone makes this machine a good investment. Dual Purpose Guard speeds planing, protects operator.



Four Speed Lathe Built chiefly for wood turning, cast iron head stock and double row pre-loaded spindle bearings make it an ideal machine for metal spinning. Give your students the advantage of Walker-Turner design!



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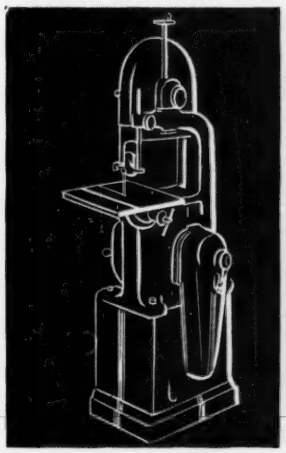

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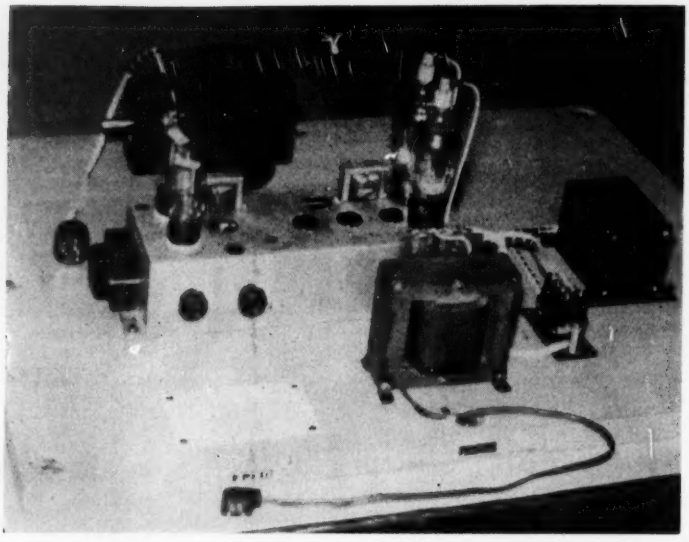
Build This Thyratron Motor Control Panel

By George H. Lyle

Electronic controls are being used increasingly for industrial equipment, so the school electrical shop should be prepared to offer instruction in this new and important field. The author teaches at the J. Sterling Morton High School, Cicero, Ill.

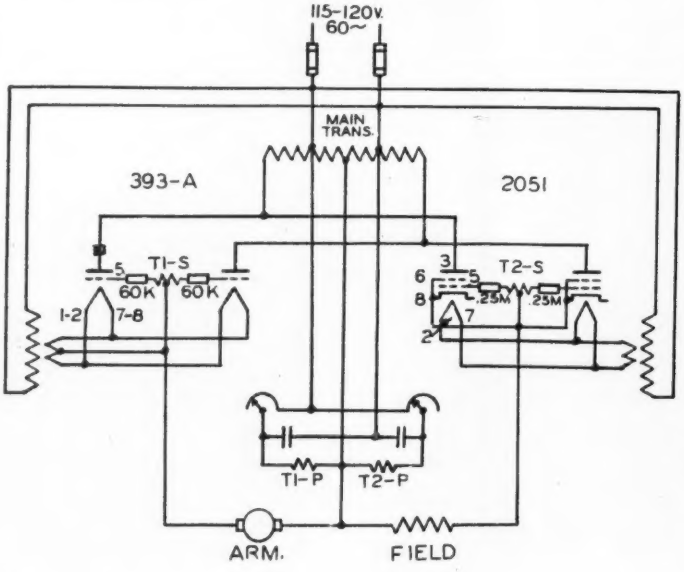


Thyratron motor control panel board with a 1/6 HP electric motor for teaching purposes

NO doubt many electric-shop teachers feel the need of a thyratron motor setup for the industrial electronics phase of their teaching, but, like the author, find it impossible to purchase a commercial unit. The equipment pictured was made up at small cash outlay, mainly from war-surplus material and odds and ends lying around the shop.

The no-load motor speed may be varied from 200 to 2300 rpm by armature voltage control, from 2300 to 4600 rpm by field voltage control. D-C voltmeters may be connected across the motor windings to show the correlation between rectified voltage variations and the speed of the armature. Since the control unit consists of two phase-shift variable voltage supplies, it may be used without the motor to demonstrate "stepless dimming" of incandescent lamps, or for any other purpose requiring variable d-c voltage within its voltage and current range.

Any teacher wishing to build a similar unit will probably improvise somewhat on the component parts, so no detailed list of parts is included. However, if a suitable motor, tubes, and transformer core are obtained, the rest of the material will not be much of a problem.



The circuit shown has been reduced to the fundamentals by omitting the current control and constant-speed control features found in commercial models. The photograph may imply more complex construction than is actually necessary. An oversize chassis with plug-and-jack connections was purposely used in this particular equipment to simplify possible later additions to the circuit. Simple breadboard mounting and permanent connections would be entirely satisfactory for the basic circuit.

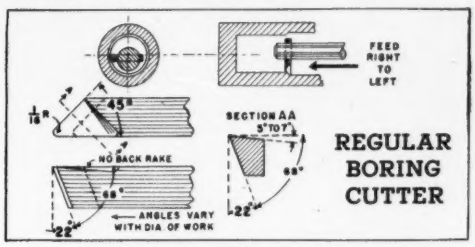
The d-c motor used is a 1/6 hp shunt machine rated at 115 v, 1.3 amp. Motor voltage in this general range is desirable, as it permits a simple and economical auto-transformer winding on the main power transformer.

Both the field and armature rectifiers are of the bi-phase, full-wave type. This gives better motor operation than half-wave; also, two small thyratron tubes are likely to be cheaper than one large one. Armature tubes are type 393-A mercury-vapor triodes, rated at 1.5 amp. average current and 1250 inverse peak volts, with 2.5-v, 7-amp. filaments. Field tubes are type 2051 gas tetrodes, rated at .075 amp. average current and 700 inverse v, with 6.3-v, .6-amp. heaters. Both of these tube types are obsolete and can be obtained quite reasonably from surplus sources. However, any available triodes or tetrodes of similar current ratings and not less than 500 inverse

(*Continued on page 22*)

Memo to mechanics — How to do it right with WILLIAMS BORING TOOLS

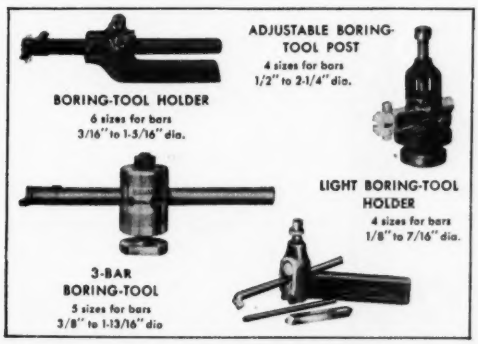
Boring Tools of this type, as opposed to drills and reamers, are used for machining internal surfaces and their operation might be described as *inside* turning. The cutters differ from outside turning tools in that they must be ground with more front clearance to prevent the heel of the tool from rubbing. Recommended grinding angles and proper application of tools to work are graphically explained in the three diagrams.

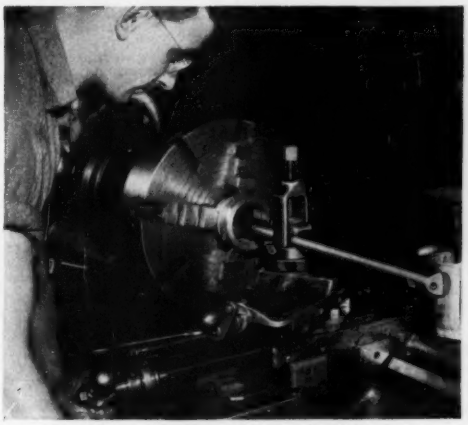


Above Cutter used with Williams Boring-Tool Posts, Holders and 3-Bar Boring-Tools

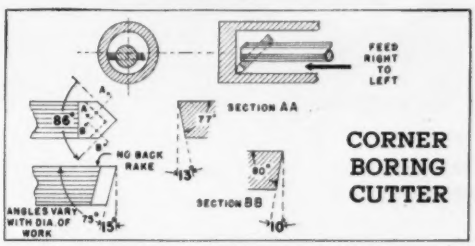
There are four types of Williams Boring Tools as illustrated below. Bars and Cutters are interchangeable in all except the Light Boring-Tool Holder. Depth of hole, of course, determines the length of bar required. When using long bars, remember that the increased overhang makes the tool more likely to spring and correspondingly lighter cuts should be taken.

Copies of this and other "Memos to Mechanics" are available free upon request.

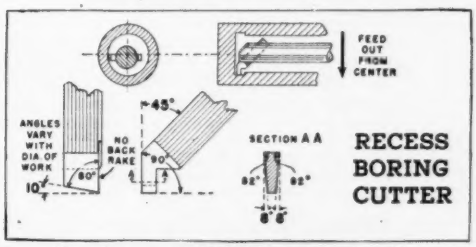

ADJUSTABLE BORING-TOOL POST
4 sizes for bars 1/2" to 2-1/4" dia.
BORING-TOOL HOLDER
6 sizes for bars 3/16" to 1-3/16" dia.
LIGHT BORING-TOOL HOLDER
4 sizes for bars 1/8" to 7/16" dia.
3-BAR BORING-TOOL
5 sizes for bars 3/8" to 1-13/16" dia



Height of bars is easily adjusted with this Williams Boring-Tool Post



Above Cutter used with Williams Boring-Tool Posts, Holders and 3-Bar Boring-Tools



Above Cutter used with Williams Boring Tool Posts, Holders and 3-Bar Boring-Tools

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peak v will serve for a motor like the one described above.

The main power transformer was made from a shell-type core with the center leg approximately 1½" square. This core was rewound with 680 turns of 20-gage wire, tapped at 205, 340, and 475 turns. When connected as shown in the circuit diagram, it provides approximately 150 v on each side of the center tap, permitting a maximum d-c voltage somewhat above motor rating. This transformer also supplies center-tapped line voltage to the phase-shift circuits. Separate filament transformers were used by the author simply because suitable ones were at hand, but, with an auto-transformer winding, there is likely to be plenty of window area in the main core for adding filament secondaries. With a center-leg core area of about 2.25 sq. in., these windings would require, respectively, five turns of 10-gage wire, center-tapped, and 14 turns of 19-gage wire for 393-A and 2051 tubes.

Each phasing control consists of a 1.0 microfarad, 200-v capacitor and a potentiometer of 15,000 ohms. Separate control knobs for the low-speed and high-speed ranges are preferable for teaching purposes, and should be connected to increase speed with clockwise rotation in each range. Two low-powered class "B" driver transformers were used for reversing the phasing voltage to the thyratron grids. These transformers are not very critical, but each must have two high impedance windings, one of them center-tapped, with the turns ratio between primary and half-secondary not far from unity. Inter-stage audio transformers might do if the winding reactance is high at 60 cycles.

Provision should be made at the output leads of the rectifier circuits for convenient connection of a voltmeter or oscilloscope for observation of the voltage variations and patterns. The oscilloscope patterns across the motor armature and lamp loads are extremely interesting and instructive.

The voltage at the thyratron anodes can safely be applied simultaneously with the filament voltage. Tubes will be damaged, however, unless the motor or lamp load is disconnected by a plug or switch until the tube filaments have been preheated. Since there is no automatic armature current control in the circuit, the motor should always be started with armature voltage at minimum, field voltage at maximum. During motor operation the field voltage should always be at maximum when armature voltage is reduced, and vice versa. Weakening both voltages at the same time may cause stalling or even reversal of the motor, with heavy sparking at the commutator and excessive peak current in the armature tubes.

One last word: don't be afraid to experiment with thyratron circuits. They are much more simple and free from "bugs" than most vacuum-tube circuits. Just remember the preheating requirement and protect the tubes from excessive peak currents.

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Chair . . . *from page* 18

The back edge of the seat board will have to be bevelled to fit the back, and the top edges of the sides should be filed so the seat board fits evenly before it is nailed in place with 8d finishing nails, which should be set and the holes puttied or filled with plastic wood.

Sanding and finishing completes the chair, which, in most cases, becomes the first house chair ever built by the student.

After making these chairs several of the author's students made half-size models for their little brothers and sisters! But, because the lumber used is not "half-size," the seat board measurements have to be about 6¼" (back) and 8¾" (front).

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Yours truly,

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Diamond Dust

Abrasive comments from that doughty Scot, Tom Diamond, former head, Department of Vocational Education, University of Michigan, Ann Arbor.

The Five-Foot Shelf in Industrial Education

LONG experience has taught us that silence is golden. Which is the polite version of "Keep your big mouth shut or someone will put his foot in it."

Since the writer has had the truth of this demonstrated to him on many occasions, one might be justified in assuming that he had acquired some wisdom concerning the matter. But, no! In an unguarded moment the urge to break into print became so oppressive that he took his pen in hand and wrote a more or less profound thesis on what every alert teacher should read (SCHOOL SHOP, June, 1951, p. 2). In the effusion which resulted from his efforts he pleaded with teachers to become acquainted with the pronouncements of the leaders in our field, and he besought them to note particularly the declarations of the men of yesteryear.

At the conclusion of this effort he patted himself gently on the back, stuck out what he is pleased to call his chest, and pronounced his philosophy "good."

Unfortunately he forgot the fellow who was standing by, with his foot poised, ready to jam it down his throat. With alarming promptness one of our diligent readers responded by inquiring in a belligerent tone, "Specifically what should we read anyway?"

The writer choked a little on this inquiry and, to mix a metaphor, pawed around frantically for a suitable response. However, as he pondered over the possibility of "passing the buck," the happy thought came to him that the National Association of Industrial Teacher Trainers, whose members are always on the outlook for a worthy project, might be expected to formulate an appropriate answer.

This seemed a happy solution so, with calm assurance that all was well, an S.O.S. was sent to a selected group of teacher trainers in the hope that they might throw some light on the question under consideration.

Apparently the assumption was well founded as the response was even better than we had any right to expect. As a result we are presenting here a list of books dealing with the general fields of industrial arts and industrial education which received the 20 highest number of votes. It will be noted that the large number of excellent books dealing with methods in specific fields have been omitted. The sole purpose of the list is to suggest sources through which the reader may become familiar with the pronouncements of our leaders, past and present. As a result, it is hoped that our readers may develop a philosophy of their own which will be based on the ideas expressed by the authors:

BOOKS TEACHERS IN INDUSTRIAL EDUCATION SHOULD READ AS SELECTED BY 46 TEACHER-TRAINERS OF 60 QUERIED. NUMBERS IN PARENTHESES REFER TO FREQUENCY OF CHECKING.

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IN THE Morning Mail . .

[Brief comments about SCHOOL SHOP and the field it serves are invited. Address the Editor, SCHOOL SHOP, Ann Arbor, Michigan.

Dear Mr. Diamond:

I have read with a great deal of interest your recent editorial in SCHOOL SHOP, "A Holiday on Objectives!" (October issue). While I do not agree with you in every respect, you have undoubtedly hit upon a problem which is of vital concern to many of us.

I regret somewhat the seeming implication (which I do not believe was intended) that objectives are not very important. I am sure that we both agree that without objectives industrial arts becomes mere *busy work.*

I am in full agreement with you, however, that we have enough (and perhaps more than enough) objectives to fully justify our work *if* we were sure that they were being achieved. I agree, too, that the most pressing need in the profession today is for some means of evaluating the extent to which these objectives are being reached. The question is "how."

May I suggest that what we need is a common denominator by which all of these objectives can be measured. Our brothers in the vocational field have solved this problem very satisfactorily by reducing their desired outcomes to measurable skills and technical information. Our task in industrial arts is not quite so simple. However, I do not believe it is insuperable. Most of us would agree, I suspect, that, reduced to simple terms, the basic outcomes in which we are interested are *changes in student behavior.* It appears, therefore, that a first step must be an analysis of each of our objectives in terms of these desirable changes. Such an analysis could be approached in much the same manner that vocational teachers have approached the problem of trade or occupational analysis. Without such an analysis, our teaching must continue to be aimless and impossible of evaluation.

Given, however, a clear appreciation of the outcomes which we want, there should be little difficulty in working out specific techniques and devices for observing and measuring (within limits) the progress of our students toward these objectives. For example, it would be difficult to measure quantitatively the amount of aesthetic appreciation a student had developed, but it would be relatively easy to observe the extent to which he exhibited behavior indicative of discriminating taste and appreciation for things beautiful and well designed.

It appears to me that we should all work together in encouraging our profession to determine rather definitely the outcomes it is seeking, and then (in keeping with your suggestions) apply itself to finding means for evaluating growth toward these outcomes.

Accept my appreciation and congratulations on this most thought-provoking editorial.

Gordon O. Wilber, Director,
Division of Industrial Arts,
State Teachers College, Oswego, N.Y.

Dear Sir:

Please accept our thanks for your excellent magazine. We use it in all our classes in industrial arts and keep a copy in our library for others to share. We also appreciate the . . . instructional aids of manufacturers advertising in your magazine.

H. F. Carter, Head, Ind. Arts Dept.,
Glynn Academy, Brunswick, Ga.

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WRENCHES . . . . . and how to use them

A prime rule in using any adjustable wrench is to first adjust it to a snug fit on the nut to be turned. (Fig. 7.) A tightly adjusted wrench is safer since danger of slippage is minimized. A loosely fitted wrench will tend to "round" the corners of hexagonal objects, and may damage the wrench by exerting undue strains on the jaws. Greasy, oil-covered tools are dangerous. Keep handles clean and dry by occasional wiping. Oil should be applied sparingly to moving parts.

Fig. 7

Adjustable Wrenches develop their greatest strength when hand pressure is applied to the side of the wrench carrying the fixed jaw as in Fig. 8. They can, however, be pulled in either direction on moderate loads, and are frequently "flopped" between

Fig. 8

swings to gain an angular advantage and permit continuous rotation of nuts or bolts where cramped quarters limit the handle swing.

"Crestoloy" Wrenches, being thinner (and stronger) than "Crescent" Wrenches, are the preferred tools for use in cramped quarters or when adjustable wrenches are used in pairs as in Fig. 9. For extremely heavy loads, Crestoloys are likewise recommended. (See tools illustrated page 15.)

Fig. 9

4

PLIERS . . . . . and how to use them

Slip Joint Pliers

Crescent Slip Joint Pliers are a general purpose tool having excellent gripping power over a wide capacity range because of their adjustable jaws. Ideal for holding or turning round pieces. Should not be used on nuts or bolt heads. (See tools illustrated page 15.)

Fig. 10

Skinning Insulated Wire

Fig. 12 illustrates the proper way to grasp a light, diagonal plier. The third and little finger "inside" the handles provide pressure to hold the jaws apart. Pressure of the thumb stabilizes the tool and maintains desired jaw opening.

To skin wire, grasp it as shown with the left hand, as in Fig. 11. Now with plier held, as shown, close the jaws sufficiently to cut through the insulation *only*. Don't cut through the conductor!

Fig. 11

Now "rock" plier handles toward left wrist and the prying action will strip the insulation from the wire end.

"Cleaning" or brightening of the bare wire is shown in Fig. 12. Close jaws just enough to provide slight pressure and draw cutter blades along the bare wire a few times. Rotate wire with left hand so that the entire circumference is clean. (See tools illustrated page 17.)

Fig. 12

5

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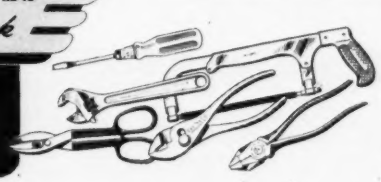

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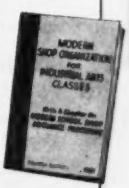

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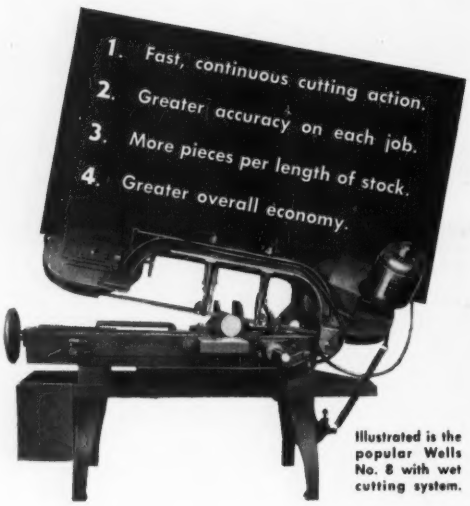
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Motor Size	1/6 H.P.	⅓ H.P.	½ H.P.	¾ H.P.
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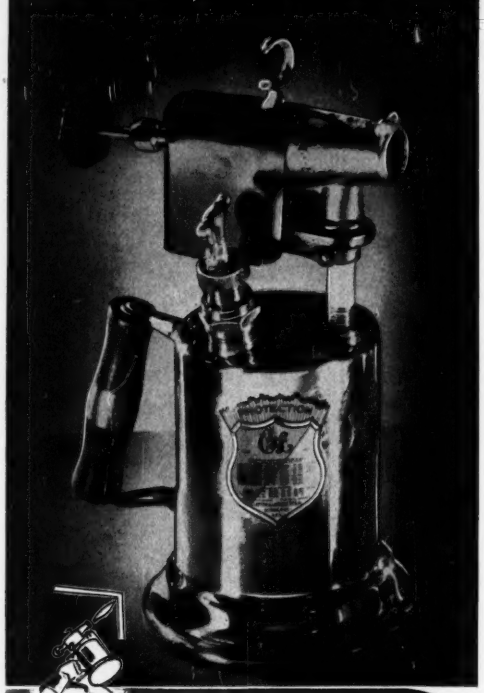

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ABOUT YOUR FELLOW TEACHERS

CARL T. COTTER, director of industrial arts and vocational education in the Toledo Public Schools since 1909, retired in June. He is now in the School Plant Planning Dept. there. . . . L. W. YOHO, assistant professor of industrial arts at Ball State Teachers College, Muncie, Ind., has been appointed director of vocational education in the South Bend, Ind., Public Schools. He succeeds G. F. WEBER who recently retired after holding that position since 1919. Mr. Weber is now in Germany where he is working for the Department of State . . . . LAWRENCE BOROSAGE, assistant supervisor, trade and industrial education service, Ohio State Department of Education, has been appointed lecturer in vocational education in the School of Education, University of Michigan, Ann Arbor. . . . GEORGE KOHRMAN, state director of trade and industrial education for Missouri, is the new director of practical arts and vocational education, Western Michigan College of Education, Kalamazoo, succeeding the late DEYO FOX. . . . JOHN F. SHEA has been promoted to assistant director of vocational education in the Massachusetts Department of Education, succeeding DANIEL H. SHAY, who retired after 30 years. JAMES L. BURKE of Medford Vocational High School has succeeded Mr. Shea as supervisor in vocational education. Other appointments in Massachusetts include the following new directors: JAMES A. BOOTH, Malden Vocational High School; DANIEL F. SULLIVAN, Lawrence Vocational School; THOMAS J. GARVEY, Haverhill Trade High School; HAROLD B. GEARY, SR., Gloucester Vocational School; MICHAEL C. O'DONNELL, Lynn Vocational High School; JOSEPH D. MAHONEY, Day Industrial Dept., East Boston High School; and HARRY J. PATTERSON, Arlington Vocational High School, replacing LEONARD SCOTT, who is now head at Westfield. . . . ALAN R. PAWELEK of Ball State Teachers College has accepted the chairmanship of the industrial arts department at Western Washington College of Education, Bellingham. . . . J. C. WRIGHT has retired to his home in Chevy Chase, Washington, D.C., after serving as consultant on vocational program planning with the Institute of Inter-American Affairs in Brazil.

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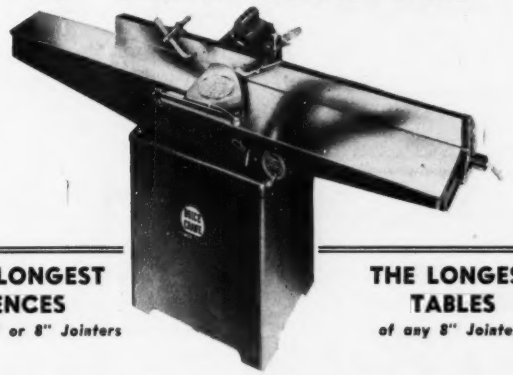

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First, saw a narrow kerf about ½" long (with the grain) in one end. The coping saw will do this very nicely. Sharpen both sides back from the kerf. This pen works well by dipping it in the ink rather than filling it with the quill. The ink seems to seal the pores of the wood; hence the pen improves with age. It is useful in preparing a layout for a silk-screen stencil.—*Carson J. Marshall, McCory-Rawson Local Schools, McCory, Ohio.*

Handling Stage Scenery

Getting stage scenery for school plays into place and moving it between acts can be a back-breaking chore. I have developed a method which makes it an easy matter to do this in a few minutes.

The photo shows how the simple three-foot triangles made of two-by-fours are

bolted or nailed to scene flats (in this case, actual house parts), and are set on casters making moving an easy matter. The five-gallon cans partly filled with sand serve as ballast to balance the sets.—*John Hodgdon, Nordhoff Union High School, Ojai, California.*

Slide Rule Settings

This handy table illustrating common uses of the slide rule was prepared in the Lansing, Mich., Public School System. It constitutes one of the lessons in the course in shop mathematics.—*Lansing, Michigan, Technical School.*

A. Multiplication; $a \times b = c$ $31 \times 22 = 682$

A		A	
B		B	
C	1 b	C	1 22
D	a c ans.	D	31 682 ans.

B. Division; $a \div b = c$ $164 \div 8 = 20.5$

A		A	
B		B	
C	b 1	C	8 1
D	a c ans.	D	164 20.5 ans.

C. Squares; a^2 means "a" squared. $4^2 = 16$

A	a^2 ans.	A	16 ans.
B		B	
C		C	
D	a	D	4

D. Square Roots; $\sqrt{\ }$ means the square root of "B"

A	B	A	81
B		B	
C		C	
D	$\sqrt{\ }$ ans	D	9 ans.

E. Ratio and Proportion. $\frac{a}{b} = \frac{c}{d}$; $\frac{3}{6} = \frac{7}{14}$

A		A	
B		B	
C	a c	C	3 7
D	b d	D	6 14

F. Sines and Cosines.

A	Sine 1
S	Angle 1
T	1
D	1

G. Tangents

A	1
S	1
T	Angle 1
D	Tangent 1

Cosine A = Sine (90 − A)

When the angle desired is greater than 45° use: $\text{Tan. } A = \frac{1}{\text{tan. } (90° - A)}$

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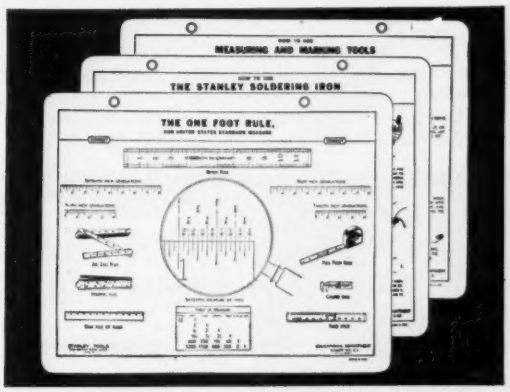

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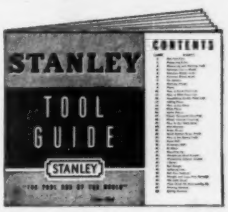

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HAPPENINGS IN INDUSTRIAL EDUCATION

New AIAA Officers

RESULTS of the third and final mail ballot for election of 1951-52 officers of the American Industrial Arts Association are as follows: President, Gordon O. Wilber, State Teachers College, Oswego, N.Y.; first vice-president, Merrill C. Hamburg, Detroit, Mich., representing supervisors; second vice-president for teacher-trainers (re-elected), Willis H. Wagner, Iowa State Teachers College, Cedar Falls; and second vice-president for classroom teachers, C. Merrill Hamilton, Raleigh, N.C.

State Meetings

THE Texas Vocational Industrial Association was formed at the Texas Vocational Association annual meeting last April in Dallas, with Floyd Spears of Kilgore as president; A. B. O'Connor of Ft. Worth as vice-president; and William Clitheroe of Pasadena as secretary-treasurer.

Fred Harrsen moved from vice-president to president of the Michigan Industrial Education Society in the recent election J. W. Giachino is vice-president.

New officers elected by the New Jersey section of the American Vocational Association include: Charles A. Haas, president; Henry J. Zanzalari, secretary; and Robert J. Kessler, treasurer.

Honoring Our Leaders

A PLAN to honor past leaders, both living and dead, in the field of vocational education by hanging their pictures in appropriate places was proposed at a testimonial dinner to George A. McGarvey, retired agent for trade and industrial education in the U.S. Office of Education, last March in New York City. Vocational institutions, directors, and teachers can get 9"x11" lithographed pictures for 25c each from The Vocational Education Foundation, 5 N. Lyon Ave., Menands, N.Y. Pictures are now available of C. A. Prosser, David Snedden, L. S. Hawkins, L. A. Wilson, F. H. Wing, Morris E. Siegel, L. H. Dennis, William Jansen, and Frederick Pertsch. It is hoped to print a "Who's Who of Vocational Leaders, Past and Present" from proceeds of the sale of the pictures.

New Buildings

THE new high school at Maplewood Park, East St. Louis, Ill., provides five separate industrial-arts shops: a general shop for junior-high boys, and unit shops for woodwork, metalwork, drawing, and graphic arts.

A new industrial-arts building is to be constructed at the Licking, Mo., Consolidated School, according to Donald E. Sater, superintendent.

In Detroit, shop additions for both the Pershing and the MacKenzie High Schools have been completed. The Pershing addition includes an auto shop, machine shop, a general purpose industrial-arts shop, electrical shop, and two drawing rooms. The MacKenzie addition substitutes a general woodworking for the auto shop.

Conferences

THE Fourth Annual Conference on Industrial Education will be held on Saturday, October 13, at The Pennsylvania State College, State College, Pa. Most of the sessions will deal with the problem of the 60 percent as dramatized in the famous Prosser Resolution. An address will be given by Dean M. R. Trabue of the College's School of Education.

The annual four-state Conference on Industrial Arts and Vocational Education will be held at Kansas State Teachers College, Pittsburg, October 26-27. Principal speakers will be Thomas Hippaka of Iowa State College, Forest Rozzell of the Arkansas Education Associa-

(*Continued on page* 36)

You know what it means to a boy when he feels he is doing *real* work with *real* tools. He has an added incentive to *work* and to *think*. He's off to a good start . . . enthusiastic . . . eager to learn. It's a pleasure to have him in your class.

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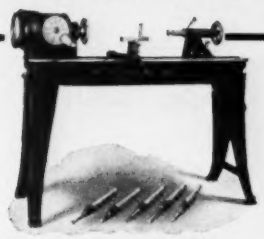

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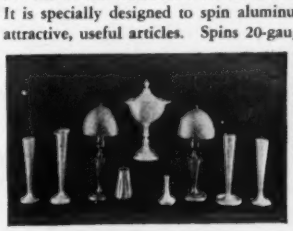

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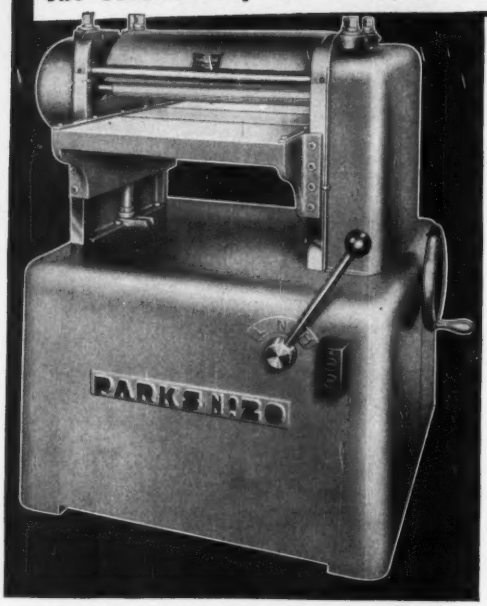

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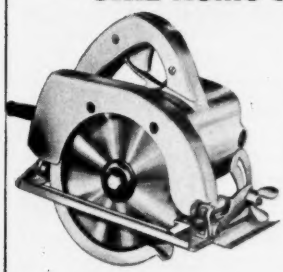

Model 520—5⅞" blade with maximum cutting capacity of 1⅞" in wood. Base adjustments: vertical depth of cut ¾" to 1⅞"; tilts for bevel cuts; 1 3/16" depth of cut at 45°. No-load speed: 5800 r.p.m. Overall length: 10⅛". Weight: 10½ pounds.

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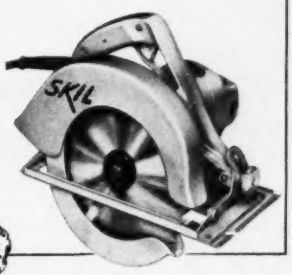

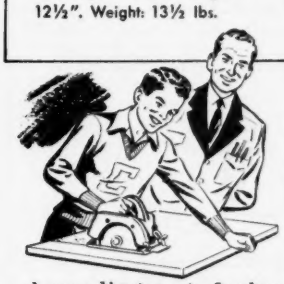

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Casting . . . *from page* 15

you probably will observe steam coming out of the lining.

A steel plate with a 2" hole in the center may serve as the cover, or you can build up a 2"-thick cover out of the clay-brick mixture, using a section of the drum for the outside form and a 2" bottle or can for the hole form. Steel reinforcing rods laid in the mixture will strengthen the lid.

Display Board . . . *from page* 16

poplar, maple, cherry, or oak. Or he may say, "I would like to have this piece match some furniture we have at home," and choose the finish and wood which will produce the effect he wishes.

The proper preparation for a finish and some of the common errors of finishing are shown by two blocks of wood across the top of the panel board. The first block is properly prepared for finish. Underneath it are listed the steps: hand planing, scraping, sanding with ½ and 2-0 sandpaper. The other five sections show the result of (1) not removing millmarks, (2) planing against the grain, (3) improperly sharpened scraper which leaves scratches, (4) the effect of glue under the finish, and (5) sand scratches caused by sanding across the grain. In the center of the board is a sheet giving brief general directions dealing with various problems of finishing. (See Fig. 1.)

The panel serves not only in the selection of material, but helps the student check his general procedure to be sure he is on the right track. With the samples on preparation for finishing, it is possible to show the student why his project is not ready to finish, and what would be the result if he did finish it too soon. It is our belief that the use of a teaching device of this type leads to a better selection of materials and improves the quality of workmanship of the finished article.

News . . . *from page* 32

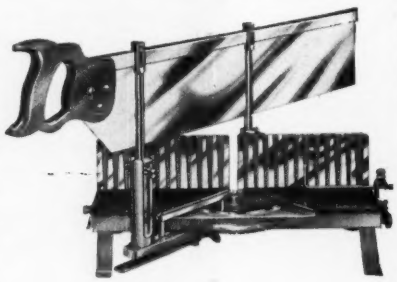
tion, and Walter A. Bowers of the Magic Circle Industrial Council, Coffeeville, Kan. A full program, including a large variety of exhibits, has been planned. The Conference theme is "Citizenship Through Industrial Arts and Vocational Education."

Shop Ticklers

[Ed. Note: Readers are invited to contribute short humorous items, illustrated or not, from their teaching experience to this new department of School Shop.]

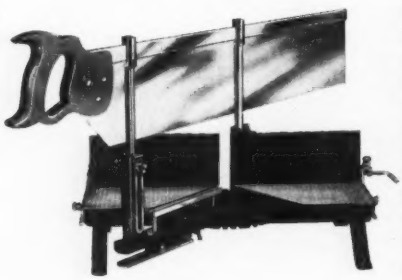
I can't remember when I didn't know what "elbow grease" meant, but there must have been a time as there was with Joey. His sanded work was mediocre so I told him to "put a little elbow grease on it." Dead serious, he walked to the finishing cabinet and started to look through the cans. One pal then another joined him and soon all three were examining each label until someone more sophisticated set them straight! —*F. C. Finsterbach, Director of Education, Walker-Turner Division, Kearney & Trecker Corp.*

FIRST CHOICE OF PROFESSIONALS — THE WORLD-FAMOUS LANGDON ACME. For hairline accuracy . . . smooth, easy operation . . . and lasting dependability —Millers Falls Langdon Acme has been recognized for years as the world's outstanding mitre box. Today this famous tool is even better. Redesigned with many new and improved features, it is more than ever the finest mitre box you can buy.



YOUR TWO BEST BUYS

in mitre boxes are both Millers Falls



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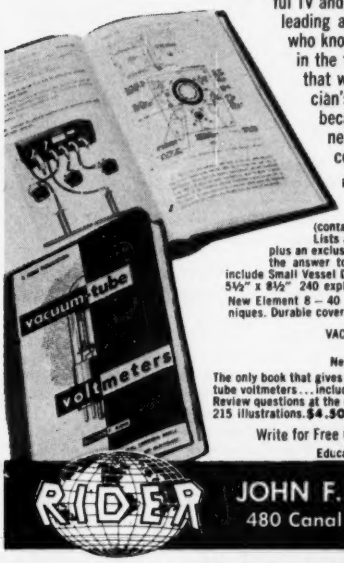

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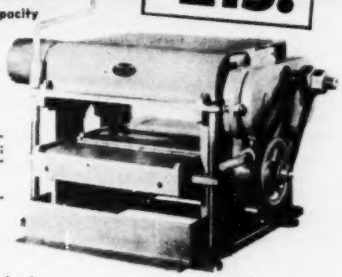

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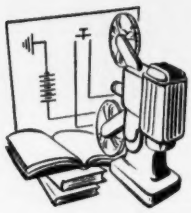

Books:

Leaders in Industrial Education. Bawden. Milwaukee: Bruce Publishing Co., 1950. Pp. 196. $3.

Intimate biographical sketches of nine pioneer leaders in industrial education. They provide a background to a better understanding of the development of this subject to its present status in public education.

William T. Bawden is retired head of the industrial education department at Kansas State Teachers College, Pittsburg.

Power Tools and How to Use Them. Lammey. Chicago: Popular Mechanics Press, 1950. Pp. 144. $2.50.

This profusely illustrated workbook tells the beginner how to set up his home workshop and gives numerous woodworking, metalworking, and plastic projects of varying complexity which have been made with home workshop power tools.

W. Clyde Lammey is assistant editor, Shop Notes and Crafts, *Popular Mechanics Magazine*, and is an experienced machinist and patternmaker.

A Primer of Engraving and Printing. Groesbeck. New York: Colton Press, 1950. Pp. 174. Paper-bound.

This little handbook tells in simple language the methods and applications of letterpress, lithography, and gravure. Provides a good reference book for the graphic-arts teacher.

Harry A. Groesbeck, Jr., was a New York City photoengraving technician before his recent death.

Television and FM Antenna Guide. Noll and Mandl. New York: The Macmillan Co., 1951. Pp. ix + 311. $5.50.

A fundamental course in theory is given in Part 1. Part 2 is a complete handbook on antennas and their installation. Numerous illustrations aid comprehension. New personal research is included.

Edward M. Noll is television instructor at the Technical Institute at Temple University, Philadelphia, Pa. Matthew Mandl is director of radio courses and lecturer in electronics at the Technical Institute.

Radio and TV Industry Red Book: Replacement Parts Buyers Guide. Indianapolis: Howard W. Sams & Co., 1950. Pp. 623. Paper-bound. 2nd Ed.

A complete revision of the original edition, giving replacement data on all major receiver components used in thousands of radio and television models.

Ingenious Mechanisms. Holbrook L. Horton. Vol. 3. New York: The Industrial Press, 1951. Pp. 536. $6.

Diagrams and descriptions of numerous standard and special mechanisms selected by experienced machine designers for use of designers and inventors for automatic machines and other mechanical devices.

Radio and Television Receiver Circuitry and Operation. Ghirardi and Johnson. New York: Rinehart Books, 1951. Pp. xvi + 669. $6.

This book aims to help the student and technician track down receiver troubles by giving a working familiarity with the design and functioning of basic circuits and their modern variations. A summary and list of questions follow each chapter and odd-numbered questions are answered in the back of the book, which also includes a glossary.

Alfred A. Ghirardi is advisory editor of *Radio-Television-Electronic Service Magazine*, and the author of several standard radio books.

Voltage Regulator Manual. Everest. New York: The Macmillan Co., 1951. Pp. v + 185. $2.85.

The construction, operating principles, and servicing of the major makes of voltage regulators used in today's automobiles are logically explained in detail by the author. He has written this manual for the service repairman who has often been reluctant to tackle this new device. Simple language and diagrams help understanding. Detailed test specifications are included in the appendix.

Ralph J. Everest teaches motor tune-up at Los Angeles, Calif., Trade-Technical Junior College, and has written many articles on the subject.

Creative Hands. Cox and Warren. New York: John Wiley & Sons, 1951. Pp. xiii + 381. $6.50. 2nd Ed.

New articles and techniques have been added to the 1945 edition of this introduction to craft work for beginners. A wide variety of practical and decorative crafts for personal and home use is included, illustrated with photos. How to judge and select designs for various purposes is discussed.

Doris Cox (Mrs. George H. Thomas) has taught in the related art department at the University of Minnesota. Barbara Warren, a former pupil of hers, is now Assistant Professor in the art department at the University of Florida, Gainesville.

Ed. Note: In the May issue of SCHOOL SHOP the book, *Modern Oscilloscopes and Their Uses*, by Jacob H. Ruiter, Jr., was incorrectly listed as paper-bound. It is actually a standard cloth-bound text.

(*Continued on page 40*)

For your Auto Mechanics courses

Voltage Regulator Manual

This complete text on the construction, operating principles and servicing of the voltage regulators used in today's cars fully explains the function of every element and circuit in the regulator, battery, and generator; describes in detail each of the major makes of voltage regulators; and gives step-by-step procedures for testing and making adjustments. $2.85

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Pamphlets:

The School Administrator and Vocational Education. Salary Incentives for Teachers of Industrial and Distributive Education. Both these pamphlets have recently been released by the American Vocational Association, Inc., 1010 Vermont Ave., Washington 5, D. C. The first answers common questions of administrators about sound vocational practices. Single copies are free; quantity prices available on request. The second points out the need for schools to revise salary schedules to allow for practical experience in industrial and distributive fields. Copies are 15c each.

List of Instructional Materials for the Supplementary Training of Apprentices and Other "On-the-Job" Trainees. This is the second complete revision of this pamphlet, compiled by the Vocational Division, Office of Education, Washington 25, D.C.

Sources of Information in the American Graphic Arts. This 70 page plastic-bound booklet is a comprehensive compilation of bibliographies, directories, trade periodicals, most recent books (since Jan., 1945), libraries, and miscellaneous sources of information on graphic arts in this country. It may be obtained for $2 from Carnegie Press, Carnegie Institute of Technology, Pittsburgh 13, Penna. It was compiled by George J. Mills, Assistant Professor in Printing there.

Dial Cord Stringing Guide. Vol. 2. Indianapolis: Howard W. Sams & Co., 1950. Unpaged. $1. This pamphlet for radio repairmen gives data on receivers manufactured in the two years since Vol. 1 was published. All cord types are listed, and new ones are diagrammed.

Working Together is a 44-page manual designed to assist educators, businessmen, and industrialists in organizing and conducting work-study courses for youth to prepare them for specific occupations. Eight vocational educators assisted the Education Department of the National Association of Manufacturers (14 W. 49th St., New York 20, N. Y.) in its preparation. Free copies are available.

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Six Silent Filmstrips on Photographic Darkroom Procedures are available from McGraw-Hill Book Co., Text-Film Department, 330 W. 42nd St., New York 18, N.Y., for $4.50 each or $24 for the series. Titles are: Developing Roll Film, Developing Sheet Film and Film Pack, Contact Printing, Projection Printing I and II, and Spot Printing and Dodging. Technical help was given by professional photographers, editors, and teachers of photography.

Faces and Figures is a 28-minute sound-color film portraying methods of processing wood veneers and matching faces to obtain unusual designs in plywood construction. Various uses of hardwood veneer and plywood are demonstrated. Obtainable on free loan from The Veneer Association, 600 South Michigan Ave., Chicago 5, Ill.

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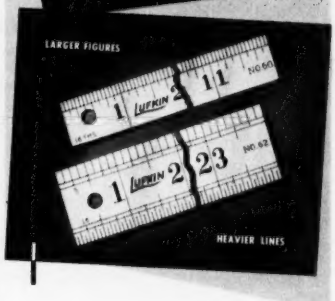

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News from INDUSTRY

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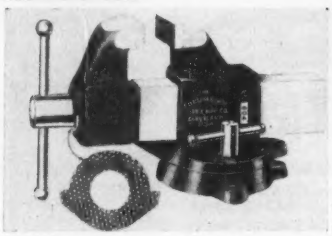

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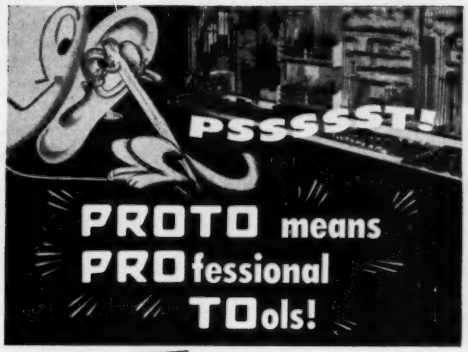

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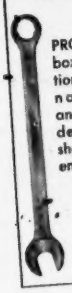

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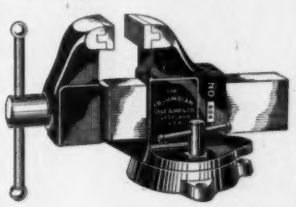

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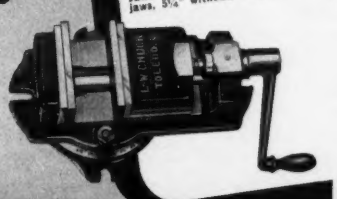

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Physical Ed . . . . *from page* 13

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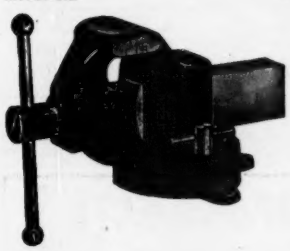

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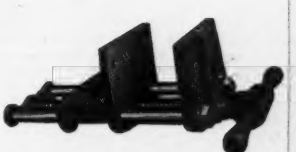

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Washington . . . *from page 48*

both FSA and USOE.

The Senate Committee on Executive Departments planned to begin hearings on the bill on August 14. It is unlikely they will have been concluded by the time this issue of SCHOOL SHOP is distributed.

Finances Again. — Vocational education starts a new school year, facing but little belt tightening, and with the prospect not only of having the slightly tight belt loosened, but having it expanded beyond normal.

Faced at the beginning of the calendar year with a $10 million cut in grants-in-aid funds, a successful fight has been concluded. Although at the time this issue of SCHOOL SHOP went to press final decision had not been had on fiscal 1952 appropriations, funds under the George-Barden Act appeared to be more than secure. Agreement had been reached and the Congressional hold-up revolved around an issue which did not affect the vocational education program directly.

Here, briefly, is the history of the battle for George-Barden funds, a battle won in a very nice fashion:

The Bureau of the Budget knocked $10 million from George-Barden Act requests from the Office of Education.

Before the budget was sent to Congress the $10 million was restored, but not as a part of the G-B program. It was put in for defense traning and there was no spelling out of the agency which would administer this special program. Allocations, even if by the U.S. Office of Education, would not necessarily have followed the G-B formula.

Having succeeded in getting the amount requested, the next battle was to have it placed where vocational education leaders thought it should go, under the George-Barden Act.

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The next battle was to prevent cuts by an economy-minded Congress, and all was preserved except the $1,700,000 plus for distributive education, in the House.

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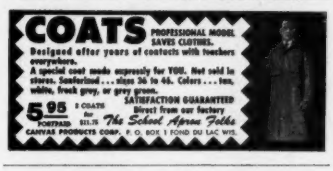
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In the Senate the full amount was preserved, and in conference a compromise was reached allowing $900,000 for D.E.

As SCHOOL SHOP went to press plans were under way to request a deficiency appropriation to carry the full D.E. program through the second term. Funds allotted were sufficient for about a half year.

Meanwhile, the Congress was considering a request for $5 million for defense training, with the possibility that more will be required later this year.

Vets' Class Time Increased.—Thousands of veterans in trade and industrial classes have to go to class at least 30 hours a week now in order to be considered full-time students under the GI Bill, instead of 25 hours as formerly.

The new requirement which went into effect July 1 is part of Public Law 610, enacted by Congress nearly a year ago. Only full-time students are entitled to full rates of subsistence pay, which ranges from $75 to $120 a month, says the VA.

Veterans affected by the law's new attendance requirements are only those in below-college-level trade and technical courses where shop practice forms an integral part of their daily activities. Allowance is made for a 30-minute breather or rest period each day which can come out of the 30-hour requirement.

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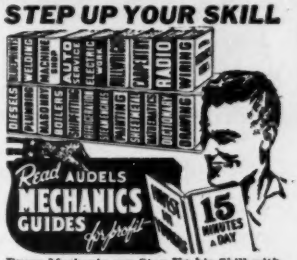

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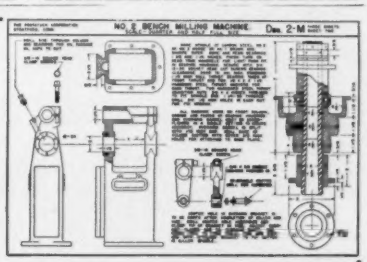

Sample of drawings. Note helpful instructions.

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SCHOOL SHOP
WASHINGTON BUREAU

To Stay or Not to Stay?—The biggest fight in vocational education is shaping up as the Senate considers a bill which would transfer the Agricultural Education Service from the U.S. Office of Education to the United States Department of Agriculture.

It is part of a bill to reorganize the Department of Agriculture along the lines of the Hoover Commission Report, although this specific move was vetoed by a task force. The Task Force on the Federal Security Agency, however, did recommend that services should be aligned with the department they were designed to promote.

Vocational education—as well as general education—is split wide open over the issue, with some leaders in the field reportedly very much in favor of the separation.

Among those reportedly in favor of the separation is L. H. Dennis, former Executive Secretary of the American Vocational Association. Mr. Dennis had a long-time feud with Dr. John W. Studebaker, former Commissioner of Education, and on whose shoulders is laid the blame for many grievances, alleged and otherwise, of vo-ag people. Mr. Dennis shed no tears when Dr. Studebaker left the U.S. Office in a squabble with Federal Security Administrator Oscar Ewing.

The national farm organizations—American Farm Bureau Federation, National Grange, and Farmers Union—all favor the transfer.

American Vocational Association's Executive Secretary M. D. Mobley on July 30 sent a letter to all state supervisors of agricultural education and state directors of vocational education asking guidance for an AVA stand.

Agricultural education people in the U.S. Office of Education are understandably neutral. A position, pro or con, on their part would carry the risk of being wrong and thus endanger their careers.

One of the reasons why the decision on this issue is tough is explained by C. E. Rhoad, former chairman, vocational education department, University of Nebraska, in a letter to the Editor of the magazine, *Better Farming Methods* (August 1951 issue).

Sound educational principles, he said, called for vo-ag to remain under the U.S. Office of Education, but . . .

When men like Studebaker, McGrath, and Gregory perpetrate such professional misdemeanors as I shall now name, then drastic steps must be taken.

1. In an arbitrary and dictatorial manner the regional agents were so "reorganized" as to make them ineffective.
2. Travel funds were diverted to use by other than vocational people.
3. Federal staff members were deprived of adequate secretarial help.
4. The teacher-training standards have been destroyed.

That's the nub of the issue. Vocational agriculture feels it does not have a seat at the main table under the U.S. Office of Education—and is prepared to back up assertions with facts and figures. On the other hand, it is an educational function, even though it is perhaps 95 percent agriculture.

It is felt in some quarters that transfer to USDA would make the annual job of getting appropriations from Congress easier. The big farm organizations—"lobbies" if you will—feel they have been carrying the load for all vocational education funds.

AVA is on a particular spot, since it must try to look out for all its membership, and vo-ag members number 13,000—about one-third of the total. Yet if the help from the farm groups in getting funds is as important as many seem to feel, the separation would hurt trades and industry, distributive education, and home making. The revised S. 1149 transfers only agriculture education and not home making, as did the original.

Probably what would make its leadership happiest would be to have the proposed transfer fail, but for the issue to be so close as to "scare" the U.S. Office of Education into satisfying the grievances of the vo-ag group.

Vo-ag people have a natural fear of being swallowed up in the big USDA organization, and perhaps being dominated by the Extension Service, but the Citizens Committee for the Hoover Report, in offering a revised bill, has attempted to protect against that fear.

A tempting morsel held out to vo-ag teachers is the hope that they could participate in the federal retirement program, as do county agents, many of whom, thanks to state and federal retirement programs, can retire on very tidy incomes.

In the last analysis, the issue will be determined by where vo-ag feels it can best be served. On the one hand is the alleged inadequacy of the USOE. On the other hand is the strong support given by the farm organizations (the Grange was an early fighter for vocational education) and by USDA itself. As an example, records of recent conventions of Future Farmers of America show that the top brass of USDA has a better record of attendance than the top brass of

(*Continued on page* 46)

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HIDE GLUE AT ITS BEST

Exactly like the fine old hot hide glue you know is best for all woodwork—yet it is ready to use right out of the can. No waste because of over-mixing or spoilage. Ready when classes start. Foolproof for beginners.

WILL NOT DULL TOOLS

Franklin hide glue never gets hard or brittle. It is resilient and tough like raw hide. It is easy to use and easy on tools.

DOES NOT STAIN WOOD

MAKES JOINTS STRONGER THAN THE WOOD ITSELF

Tests prove more than 4000-pounds-per-square-inch strength. Stronger than any wood.

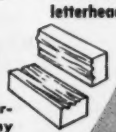
HAVE YOU MADE THIS TEST?

1. Squeeze a little Franklin Glue on a piece of glass or clean wood. Squeeze out the same amount of any other liquid glue beside it.

2. Let set overnight, then compare the two. Leave for two or three days and note the difference.

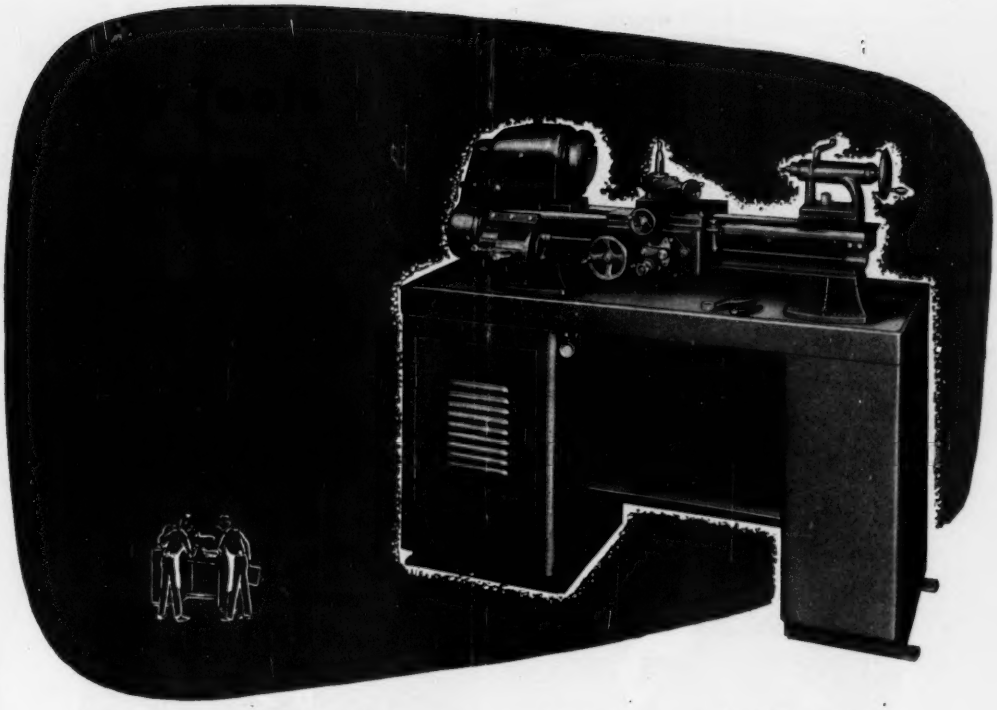
FREE

Samples sent when request is made on official school letterhead



The Franklin Glue Co.
129 W. Chestnut St.
Columbus 15, Ohio

THE CHOICE OF FINE CRAFTSMEN EVERYWHE
USED BY MANUFACTURERS OF QUALITY FURNIT



LOGAN "955" 11″ LATHE

The 955 equips the metal working teacher to train the student in every type of lathe operation. With 1″ collet capacity, 1⅜″ spindle hole, 11″ swing and center distances of 24″ or 36″, this lathe handles sizeable work *accurately*. Less than .0005″ spindle runout 12″ from the bearing; and a two-V-way, two-flat-way bed precision ground to within .0005″ maximum variation are typical of the tolerances to which it is built. The 45 to 1500 rpm speed range of the ball bearing mounted spindle permits all operations from roughing to high speed carbide tool cutting. Completely enclosed headstock, countershaft and motor means maximum safety for the student. The 955 is ruggedly built for hard school shop use. Its trim, compact steel cabinet is ideal for multiple installations. No other lathe of comparable specifications is comparable in low initial cost. Write now for full information.

LOGAN ENGINEERING CO.
4901 West Lawrence Avenue, Chicago 30, Illinois

LOGAN 8″ SHAPER

brings to the school shop the capacity, precision and versatility that make it a widely used industrial tool. Powerful 8½″ stroke. Six automatic feeds in either direction, from .002″ to .012″. Designed for safety.